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FWS/NFC-L/81-1
OCTOBER 1981

TROUT STRAIN REGISTRY

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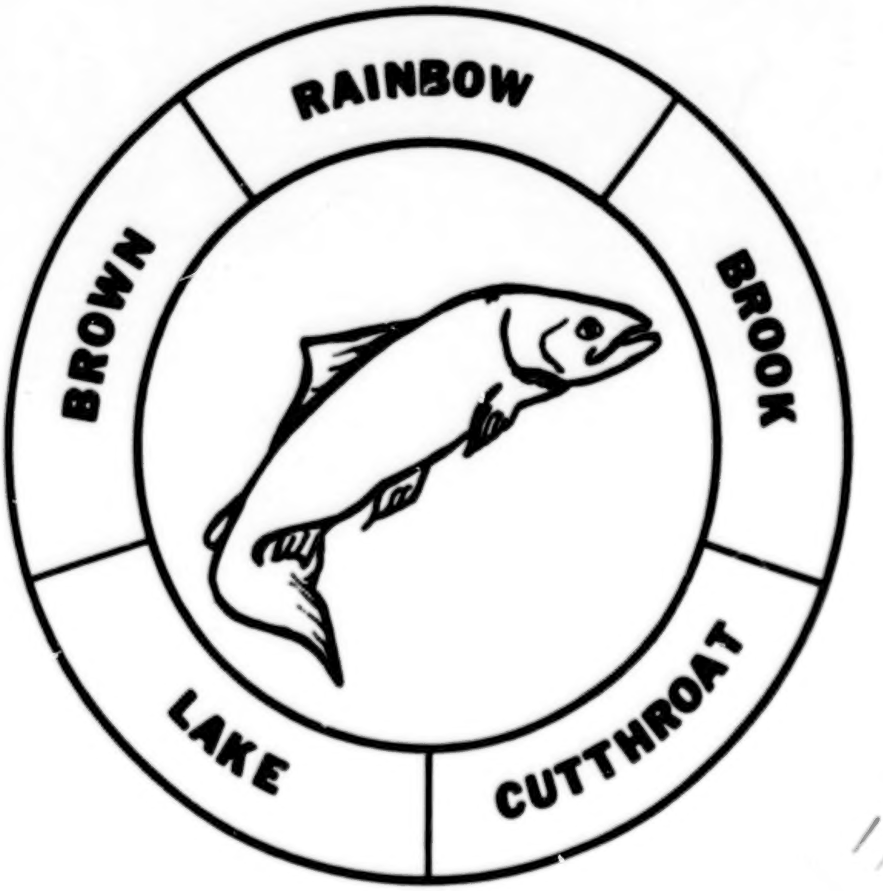

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FISH AND WILDLIFE SERVICE
U.S. DEPARTMENT OF THE INTERIOR

FWS/NFC-L/81-1
September 1981

TROUT STRAIN REGISTRY

by

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Published by

NATIONAL FISHERIES CENTER-LEETOWN
U.S. FISH AND WILDLIFE SERVICE
ROUTE 3, BOX 40
KEARNEYSVILLE, W.V. 25430

FORWARD

The Trout Strain Registry is intended to provide user groups with basic information about performance characteristics of different strains of rainbow trout (Salmo gairdneri), brook trout (Salvelinus fontinalis), brown trout (Salmo trutta), cutthroat trout (Salmo clarki), and lake trout (Salvelinus namaycush).

The Trout Strain Registry identifies different brood stocks of each trout species now being used in fishery management programs. Information about brood stocks in the National Fish Hatchery System was provided by the U.S. Fish and Wildlife Service Division of Fish Hatcheries. Information about brood stocks in State Fish and Game Departments was obtained from a questionaire sent to each state. Detailed information on the performance characteristics of 25 rainbow trout strains evaluated in the Fish and Wildlife Service's rainbow trout strain evaluation between 1974 and 1979 are reviewed.

The collection and summarization of information on trout strains is a continuing task, and any summary of strain performance can only be an interim report. This report provides currently available strain performance information that will require updating as additional data is obtained.

I gratefully acknowledge the assistance provided by many persons during the preparation of this manuscript: The staff of the Fish Genetics Laboratory who conducted the research and collected the data; James Wright, Garland Pardue, Ray Simon, Jon Stanley, Joseph McCraren, and David Ostergaard, who reviewed the manuscript and made many helpful suggestions; and Walter Bridges and Robert Putz, whose encouragement played a vital role in the completion of this project.

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INTRODUCTION

Fishery managers work toward effective management of fishery resources in the face of diverse demands for recreational fishing and preservation of natural strains, the continuing loss of suitable habitat due to environmental degradation, and an increasing competition for available resources. As a result of these varied demands, it is essential that managers be provided the tools needed to manage the available fishery resources effectively. One potentially powerful tool, which has been widely discussed but not fully developed, is the production of fish strains especially suited for specific environments or management uses. Use of this approach would permit managers to select the specific fish strain that offers the highest probability of success in meeting their management objectives. This Registry summarizes much of the available information on trout strains.

Specific objectives of the Trout Strain Registry are to: (1) identify different strains of trout that are available to fishery managers; (2) provide descriptive characteristics of trout strains that can be used by managers as a basis for management decisions; (3) establish and maintain a single centralized data base for trout strain information; (4) provide a system of nomenclature to identify specific strains and brood stocks; and (5) recommend and develop a standardized system for the collection, assimilation, and distribution of available information on trout strains to user organizations.

SYSTEM OF STRAIN RECORDS

Each lot of fish reared in the National Fish Hatchery (NFH) System is evaluated on the basis of performance in the hatchery. Identification information maintained on each production lot include: Lot number, year class, species, and a code that identifies the NFH that produced the eggs, or the state or country from which the eggs were obtained. Since this numbering system was designed specifically to monitor production performance of lots in the hatchery, no provision was made for the identification of fish strains. Without strain identification in the lot identification system, it is difficult to obtain information on strain performance under different hatchery or management situations, distribution, or breeding history of distinct strains. Under this system, a strain developed at Hatchery A was known as strain A at Hatchery A but as strain B when transferred to Hatchery B and as strain C when transferred to Hatchery C. As strains were distributed to hatcheries throughout the country, different names were assigned. Consequently, brood stock names are of questionable value in the identification of different strains. The above example outlines the problem that has developed in the NFH system for naming brood stocks, but a similar problem exists in the naming system of many state hatchery and commercial brood stocks. If fishery managers are to have the information necessary to match strains to management uses and to capitalize on strain performance differences identified by research during the past few years, it is essential that breeders know what strain is being reared and what breeding records are maintained to accurately identify the breeding history of a fish strain. A complete record system would permit fishery managers to know what gene pools are used in a specific fishery and provide for the protection of genetic variability of the fish population in that fishery.

The first step in the maintenance of strain records is the establishment of a uniform identification system for the different strains within a species. Inasmuch as the past practice of naming strains by their rearing location has resulted in irreconcilable confusion, it would be desirable to start anew with a numbering system for identifying strains. This approach would permit precise identification of distinct strains. The location name now used would be retained and used in conjunction with the strain number to identify specific brood stocks within the strain. Also, adoption of this approach permits the addition of new strains as they are developed for special management uses. In this trout registry, strains were numbered consecutively as they were identified. I propose that this basic naming system be adopted for general use in fishery management.

A second task in the maintenance of strain intergrity is the development of breeding records that will enable managers to know the breeding history of each strain. This task must be accomplished by the individual brood stock manager, who would maintain a certain minimum amount of information on each brood stock. The breeding history data recorded for each lot should include at least the following four items of information:

1. The source of both male and female parents used to produce a progeny lot, especially when they are taken from different brood stock lots (different strains or year classes of the same strain).

2. The number of males and females used as parents in producing the lot--not just the total number of parents.

3. The ratio of males to females used in the mating system by which the lot was produced (i.e., one male mated to one female, two males to five females, etc.).

4. Method employed to choose the individual fish used as parents of the lot (all fish mature on a certain date, a random sample of the fish available, or a selection criterion such as a minimum fish length).

This breeding information would be available and could be recorded at the time the lot was spawned. Breeding data should be recorded for all lots spawned, whether they are intended for production or for use as future brood stock, because the lot ultimately could be used for either or both purposes. A sample format for maintaining this information is shown in Figure 1.

The "deposition of lot" section of Figure 1 would identify locations where the lot had been stocked or transferred if the breeder needed to retrieve that information in the future. This information should be maintained as a permanent record at the production station and be provided to any receiving station to identify the specific strain, brood stock source, and breeding history of the lot whether it's intended use was production or the establishment of a new brood stock.

STRAIN CHARACTERISTICS TERMS

Because one of the major difficulties in discussing strain characterization is a general lack of consensus on the definition of essential terminology, definitions of some key terms used in this registry are given here:

BROOD STOCK: A fish population living at a single location (hatchery, stream, lake) as a self-sustaining interbreeding unit maintained either naturally or artificially. Periodic introduction of fish from other sources may or may not have occurred in the past.

NATIVE BROOD STOCK: A self-perpetuating brood stock maintaining itself in a natural environment (lake, reservoir, pond, or stream) without supplementation by fish reared in hatcheries.

NATURAL BROOD STOCK: A brood stock maintained in a natural environment (lake, reservoir, pond, or stream) by a combination of natural spawning and periodic stocking with fish reared in a hatchery environment.

DOMESTIC BROOD STOCK: A brood stock maintained by man in a hatchery environment (tanks, raceways, or ponds) continuously for more than two generations.

BREEDING HISTORY

Lot Identification ____________ ____________ ____________
(strain) (brood stock) (lot)
Date spawned ____________
Male parent lot ____________ No. fish ____________
Female parent lot ____________ No. fish ____________
Male to female mating ratio ____________
Method for choosing spawners ____________
____

Disposition of lot:

Lot was transferred to:	Date	No. of Eggs (E) or Fish (F)
1.		
2.		
3.		
4.		
5.		

Comments ____________
____
____

Figure 1 Sample format for basic breeding data needed for fish lots used to produce or maintain brood stock. Information provided here allows the breeder to monitor the population over many generations.

TRANSITION BROOD STOCK: Fish population introduced into a hatchery from a natural environment as eggs or fish within the past two breeding generations. The original fish introduced are identified as either F_0-native (derived from a native brood stock) or F_0-natural (derived from a natural brood stock). First generation progeny from F_0-native or F_0-natural brood stocks are identified as F_1-native or F_1-Natural brood stocks. Progeny from the F_1-native and F_1-natural brood stocks and later generations are simply identified as domestic brood stocks. This transition terminology is necessary to recognize and acknowledge that fish transferred from natural environments to domestic environments experience strong selection pressures during the first few generations, adapting them for survival and growth in the new environment. Although this adaption process continues for many generations large changes (egg and fry survival, feeding behavior, etc.) can be expected to occur during the early generations.

STRAIN: A fish population that exhibits reproducible physiological, morphological, or cultural performance characteristics that are significantly different from other fish populations or a brood stock derived from such a population and maintained thereafter as a pure breeding population.

This definition is based on the concept that a population living in a particular environment for a long time undergoes natural selection adapting it to better survive and thrive in that environment. As this selection process continues, gene frequencies move toward an equilibrium that tends to be maintained. Strain differences are established when the gene pools of two populations have been changed sufficiently to produce significant, reproducible differences in the performance of fish from the two populations. The specific time required to produce new strains vary widely from two to several hundred generations, depending on the evolutionary or selection pressures involved.

A special problem arises as to when a fish population developed by man and having unique performance characteristics should be recognized as a new strain. For purposes of the present registry, I recognize populations as new strains if they meet all of the following conditions:

1. The population has been separated from the original source or sources for at least two generations.

2. The population has been shown to differ (significantly) in one or more performance traits from the original source(s).

3. The population is sufficiently large to permit fertilized eggs from it to be made generally available to fishery managers.

MIXED STRAIN: A fish population derived from a mixture of strains that has not evolved sufficiently to be called a strain. The term mixed strain is used as an alternative category to include all fish populations which are not recognized as strains. I emphasize that the terms strain and mixed strain are one classification higher than brood stock. Brood stock is synonymous with strain or mixed strain only in a situation where the strain or mixed strain consists of a single brood stock. Though this distinction may seem trivial in some situations, precise application of the descriptive terminology is essential if the basic concept is to be maintained.

LINE (INBRED LINE): A population developed from the mating of close relatives, especially brothers and sisters, half brothers and half sisters, mothers and sons, or fathers and daughters.

STRAIN CROSS: The progeny resulting from the mating of two different strains, one of which provides the male parent and the other the female parent.

LINE CROSS: The progeny resulting from the mating of two different inbred lines.

HYBRID VIGOR (HETEROSIS): Increased vigor in terms of growth, survival, fertility, etc., of a cross (hybrid) as compared with the parents of the cross. Hybrid vigor is associated with increased genetic heterozygosity and is found in some strain and line crosses.

Though it is recognized that crosses between strains could exhibit certain performance characteristics (growth, feed conversion, survival, longevity, etc.), that differ significantly from those of the parent strains, these differences are not found in all strain crosses. However, even when performance of hybrids is significantly different from that of the parental strains, the hybrid would not be recognized as a new strain. The "performance difference" of the hybrid may be reproducible by repeated mating of the parental strains but not by transmission from hybrid parent to progeny. Consequently these populations, if retained as brood stock, should properly be classified as mixed strains until they meet all the requirements for strain designation.

ENVIRONMENT: (1) the collective circumstances and conditions in which an individual or population lives. (2) Environmental effect is the effect of circumstances and conditions that surround an individual or population on the behavior, growth, or development of that individual or population.

HEREDITY: The sum of qualities and characteristics transmitted from parents to progeny through gametes. The characteristics of an individual or population are the net result of the combined effects of heredity and environment. Hereditary variation is used by the fishery manager in the selection of a strain that has the genetic potential for superior performance in a specific environment. Knowledge of strain characteristics provide the fishery manager with the opportunity to accurately choose a specific strain (heredity) that can yield improved performance in a particular fishery (environment).

REVIEW OF LITERATURE ON TROUT STRAINS

Strain differences and their relative value in various hatchery and field situations have often been observed by field biologists, hatchery managers, and fishermen. Unfortunately most of these observations have not been published and are therefore not a part of the scientific record. In view of current emphasis on matching a fish to a specific environment, it is imperative that strain differences and their relative values under a variety of environmental conditions be carefully documented. In this review, I summarize some of the published literature on fish strains by species and point out needs for additional research.

Strain Distribution

Rainbow trout were historically restricted to western North America from Alaska to Mexico (MacCrimmon, 1971). Available records indicate that fish and eggs were distributed during 1874-1955 throughout the United States and Canada, and to many foreign countries (MacCrimmon 1971, 1972; Behnke 1972; Dollar and Katz 1964; Needham and Behnke 1962; Wales 1939). Eggs from McCloud River in northern California were widely distributed between 1874 and 1900, leading to the conclusion that the McCloud strain is ancestoral to many existing brood stocks. Work by Scott et al. (1978), who traced the origin of rainbow trout in New Zealand suggested that the presence of egg shipment records from the McCloud River Station (established by the U.S. Fish Commission in 1879) and the lack of continuous records from other producers during the late 1800's may have caused an overemphasis of the role of the McCloud strain as the ancestor of present brood stocks. Because the McCloud Station was the major trout cultural operation at that time, it is logical to conclude that the McCloud strain made a significant contribution to the expanded distribution of the rainbow trout; however, the contribution of other strains that were produced by private commercial fishery operations should not be ignored, since distribution of rainbow trout eggs from other drainages began as early as 1878 (Scott et al. 1978).

Beginning in 1895, steelhead trout from the Northwest were also widely distributed. Because the McCloud, steelhead, and many other resident forms of rainbow trout have been repeatedly transferred between hatcheries without written records, and have been crossed and stocked into the same waters since 1874; the specific identity of these original strains is largely (and irretrievably) lost (MacCrimmon 1971, 1972; Dollar and Katz 1964).

Two factors have contributed to the course of natural strain development during the past century, brood stock hybridization and selection for adaptation to specific environments. Needham and Behnke (1962) pointed out that some rainbow trout brood stocks may have hybridized with cutthroat trout, as evidenced by the occasional occurrence of faint cutthroat "slash" marks and basibranchial teeth in the rainbow trout. The commonly accepted practice of exchanging strains of fish or fish eggs between widely divergent hatcheries throughout North America provided many opportunities for strain hybridization to occur in the hatchery; when fish from these strains were stocked together in the same fishery, the opportunity for strain hybridization also occurred in nature. Strain hybridization has played a role in the development of many brood stocks (R. Simon unpublished data).

The second factor is the many generations of natural and artificial selection that have adapted individual populations for survival in a variety of environments. Understanding the role of breeding practices in the development of strains is invaluable for understanding the wide range of variability observed in rainbow trout and other fish species. These practices also point out the difficulty involved in the clear identification of strains based on breeding history alone. Because it is difficult to accurately trace breeding histories for more than a few generations and because some of the effects of selection, inbreeding, and brood stock crossing are unknown, I recommend that strains be recognized primarily by differential performance in management situations. The use of breeding histories, however, remains an important tool for identifying different brood stocks when the information is available (Dollar and Katz 1964; Kinunen and Moring 1978; Busach and Gall 1980). The present lack of information about the performance characteristics of different strains and the changing needs of fishery managers will undoubtedly make further refinements of this general approach necessary.

Disease Resistance

In early work on the performance of different trout strains (brood stocks), the relative performance of domestic and "wild" strains was examined. One of the earliest studies was that of Embody and Hayford (1926), who reported on disease resistance in brook trout. They found that after survivors of natural bacterial infections were selected for three generations, fish of the fourth generation were less susceptible to the disease and grew faster. Other studies in which "wild" and domestic strains were compared showed that the domestic strains tended to grow faster, mature at an earlier age, produce more eggs per female (though hatchability was lower), and exhibit higher resistance to diseases than the "wild" strains. Wolf (1954), who studied resistance to ulcer disease and furunculosis in domestic strains of brown trout (7 strains) and brook trout (11 strains), reported large strain differences in total mortality over an 11 month test period. The study suggested that the large variation in disease resistance among the tested strains could have a genetic basis and that these traits could be enhanced through selection.

Ehlinger (1964, 1977) reported an increased resistance to furunculosis in both brook trout and brown trout when strain crosses were mass selected after their exposure to *Aeromonas salmonicida*. Gjedrem (1976) and Gjedrem and Aulstad (1974) reported differential mortality (range, 0.9-30.0%) among 15 strains of Atlantic salmon (*Salmo Salar*) during an outbreak of vibriosis in 1972.

Tolerance to Acid Water

Robinson et al. (1976) found large differences among strains in the survival of seven inbred lines of brook trout exposed to acid water. Tolerance to acid water was related directly to fish size and inversely to water temperature. The authors suggested that it should be possible to find or develop strains that could successfully tolerate pH levels as low as 4.0. Johnson (1975, 1977) reported significant strain differences in mean time to death in acid water for nine brook trout strains and their hybrids. Longer survival time of the F_1 cross between the domestic and Temiscamie strains than the parent strains led Johnson (1975) to recommend the use of the fast growing crosses for fall stocking as fingerlings. The Horn Lake and Temiscamie brook trout strains were identified as having above average tolerance to acid water environments. Gjedrem (1976) reported a broad range in survival (range, 0 to 58%) among 77 strains of brown trout held in acid water (pH 4.7 to 5.2). Each of these studies suggested the existence of differential acid tolerance among trout strains and the possibility of increasing tolerance to low pH through selection.

Growth

As early as 1925, Frantz (in Embody and Hayford 1926) reported strain differences in growth rate, fry from wild fish being much smaller than fry from domestic fish. Haskell (1952) reported growth rate differences among fingerlings from three wild strains of lake trout reared in hatcheries to 6 months of age. Comparison of wild and domestic brook trout strains stocked in a pond as fingerlings showed that the wild fish were significantly longer (30.0 vs. 27.9 cm) but significantly lighter (227 vs. 238 g) after 18 months in the pond (Greene 1951). Differences in body conformation based on condition factors were highly significant, the domestic strain yielding a heavier and deeper bodied fish.

Flick and Webster (1976) found little difference in growth between domestic and wild strains of brook trout. However, domestic strains tended to be shorter bodied and have higher condition factors. Comparison of the growth of fish from wild, domestic, and hybrid brook trout strains demonstrated that the hybrid strain yielded the fastest growth during a 5-year period after stocking; the domestic strain ranked second through 2 years of age, and the wild strains ranked second thereafter. Ayles (1975) studied wild and domestic rainbow trout stocked in small eutrophic winterkill lakes in 1972 and 1973 to show that domestic strains yielded significantly larger fish at the end of the growing season. The two different wild strains tested during the study did not differ in growth performance.

Refstie and Steine (1978) reported large size differences in both length and weight in 32 strains of Atlantic salmon after a growth period of 228 days. Heritability estimates ranged from 0.08 to 0.15 for weight and 0.12 to 0.17 for length. Gjedrem (1976) and Gunnes and Gjedrem, (1978), who examined the growth of 37 strains of Atlantic salmon after 2 years in sea water, found large strain differences in both length and weight. Heritability estimates for length (h^2=0.28) and weight (h^2=0.31) were relatively high, suggesting that the observed strain differences could be further widened by selection.

Gall and Gross (1978) evaluated reproductive performance in three California strains of rainbow trout brood stock over five spawning seasons. Strain differences were found in post-spawning weight of 2-year-old females. In addition, the relation between male and females weights differed among the three strains: males were heavier than females in the Shasta and Whitney strains but lighter in the Hot Creek strain. Strain differences in average fertility (percent eyed eggs) were partly attributed to inbreeding in the Hot Creek strain. Other strain differences in reproductive performance occurred in volume of eggs produced per female, egg size (number of eggs per ounce), and egg number (total number of eggs produced per female).

Growth of fingerlings of four rainbow trout strains fed an experimental soybean protein diet for 168-days showed significant differences in strain growth (Reinitz et al. 1978). Ranking of the four strains in relation to growth rate during this trial was identical with that in companion lots reared on the U.S. Fish and Wildlife Service Open Formula Diet at the Fish Genetics Laboratory (Kincaid unpublished data).

Hatchery production testing of 13 strains of rainbow trout and two hybrids at the Bozeman (Montana) Cultural Development Center between 1974 and 1979 demonstrated large strain differences in attained weight and feed conversion efficiency at all ages from 147 to 364 days. Weight differences were well established by 147 days and continued to increase through 364 days. Mean weight differences of 30% at 364 days of age were common. The relation between attained weight and feed conversion was high in each of the rearing trials; mean correlation was about - 0.90 (Piper and Osborne 1976; Kincaid unpublished data).

Growth studies at the Fish Genetics Laboratory between 1974-1979 examined the performance of 25 strains of rainbow trout held in the same environment. Five strain differences of special significance to fishery managers follow.

1. Attained weight at 147 days - at this age, when fish weight approximates that at which fingerlings are usually stocked, large differences (204%) in average fish weight were observed ranging from 2.3 to 7.0g (196 to 64 fish per pound). Though actual fish weights varied from season to season, this approximate range and ranking of the strains was repeatable in different year classes. Relative size differences established by 147 days or shortly thereafter tended to be maintained until the onset of sexual maturity.

2. Attained weight at 364 days - at this age when fish weights approximate those of fish normally stocked as fish of catchable size ($\geq$ 21cm long), mean weights of fish of different strains ranged from 85 to 202g (5.3 to 2.2 fish per pound)--an 138% difference. In management programs geared to stocking trout of catchable size, fish of the faster growing strains could be released 30 to 90 days earlier than fish of the slower growing strains held under the same rearing conditions. Generally fish of the faster growing strains converted feed more efficiently, thereby lowering production cost. A practical problem exists where accelerated growth strains are used for production of fish of catchable size after a growth period of 12-18 months (i.e., winter or spring spawners stocked the following spring and summer). In this situation, it may be advantageous to use slower growing fish that normally reach stocking size about the time they are scheduled for stocking, rather than fish of an accelerated growth strain that must be held back to prevent their becoming too large by stocking time. This decision is made by most hatchery managers required to produce catchable size fish for stocking between April and August.

3. Attained weight at 2 years of age - mean weight of females was 335 to 1034g, fish of fall strains weighing nearly twice as much as those of winter strains. This range in weight difference is at least partly attributed to the domestic origins of fall strains and a history of selection for faster growth. Winter strains, on the other hand, included both domestic and natural strains. However, differences in origin do not change the fact that fall-spawning strains were generally heavier than winter- or spring-spawning strains at 2 years of age. Thereafter, the accelerated growth strains grew more slowly; strain differences in fish weight were still present at 3 years of age but were considerably smaller than at earlier ages.

4. Age of sexual maturity - strains that showed faster growth rates to 2 years of age also tended to mature earlier, as shown by higher frequencies of precocious yearling males and mature 2-year-old females. The period of reduced growth and cessation of growth associated with maturity at 2 years of age accounted for the reduced strain differences in weight at 3 years of age.

5. Frequency of deformed fry - all strains produced some fry that were deformed at the swim-up stage; however, strains with long histories in hatchery environments tended to yield higher frequencies of deformed fry. The two strains that yielded the highest frequency of deformed fry were the Wytheville (14.9%) and Manchester (14.0%); the frequency in all other strains ranged only from 4.3 to 7.1%. The higher rate of occurrence in the two long established hatchery strains would appear to be the result of increased levels of inbreeding.

Survival

Greene (1951) found that in a stocking of fingerling "wild" and domestic brook trout, the domestic strain provided a higher return to the creel during the first fishing season, but a smaller return during the second season. the larger size (faster growth rate) of fish of the domestic strain also made them more susceptible to angling during the first fishing season and accounted for the higher recovery rate. Differential recovery rate during the second fishing season, when fish from both strains were of about equal size and therefore assumed to be equally vulnerable to angling, showed that survival was higher in fish of the "wild" strain. A similar pattern of better survival of the "wild" strain into the third fishing season was also observed, even though both strains were largely depleted by that time. Greene concluded that more satisfactory angling was provided by stocking a mixture of both strains, rather than either strain alone.

Miller (1951, 1953), who studies survival of 2- and 3-year-old hatchery-reared and native cutthroat trout in Gorge Creek, found that all hatchery reared fish lost weight for a period of 40 days after stocking. Weight was gradually regained thereafter, and by 100 days after stocking, the hatchery fish had attained their initial planting weight. Survival of the stocked fish over the first winter was only 1 to 2%. In a second study, in which pond reared hatchery fish and transplanted "wild" fish were compared, the first-winter survival was 2.8 and 46%, respectively, and second-winter survival 1 and 29%. Stream reared hatchery fish yielded a first-winter survival of 17.0%. Greene (1951) suggested that part of this lower survival of the hatchery fish was due to the absence of natural selection pressures during early stages in the life history. The intermediate survival of the stream reared hatchery group appears to support this idea.

Boles and Borgeson (1966) and Calhoun (1966) reported on three brown trout strains stocked as catchable size fish in lower Sardine lake (California) in 1959. They found large differences in the rates of return for Massachusetts, Whitney, and Convict Creek strains during both the first season (43, 22, and 13%, respectively) and the second season (20, 15, and 11%). Annual survival rates for the three strains were 36, 48, and 61%, respectively. Substantial numbers of fish of all three strains survived to 4 years of age but growth differences were not evident because few fish were longer than 28cm.

Borgeson (1964) examined the economics of managing cold-water reservoirs with five strains of rainbow trout fingerlings. The Kamloop strain was the most economical when strains were evaluated in the field from creel data. It was not the most economical, however, in a study at Beardsley reservoir between 1961 and 1965 (Cordone and Nicola 1970) in which four of the strains evaluated by Borgeson were tested. When Kamloop fingerlings were stocked as young of the year, the return varied from 2 to 5%. Returns improved dramatically when the fish were stocked at 12-14 months of age, but the added time in the hatchery increased production cost. Overall the Shasta, a domestic strain, was more economical in the Cordone and Nicola study. The reason given for the improved survival of the Kamloop was their occupation of the littoral areas of the reservoir; this behavior enabled them to avoid capture at a small size more successfully than the other three strains tested. The performance of the Whitney and Virginia strains was poorer than that of either the Kamloop or Shasta strains in all comparisons.

Rawstron (1973) compared the Kamloop, Shasta, and Whitney strains of rainbow trout,planted as catchable size fish in four California impoundments during 1969 and 1970. All three strains yielded similar total survival and growth rates, but the Kamloop consistently yielded a higher total weight to the creel. Apparently fish of the Kamloop strain were more uniformly distributed throughout the lake (as in the study by Cordone and Nicola 1970) and avoided capture during the first few months after planting. Fish of the Shasta and Whitney strains tended to congregate in the littoral zone and were therefore caught earlier in the season and at a smaller size. Rawstron (1977) evaluated catchable size rainbow trout of the Eagle Lake and Coleman strains, stocked in Lake Berryessa. The Eagle Lake strain yielded the higher return (42.9 vs 32.6%), annual survival (32 vs 28%), ratio of weight recovered to weight planted (190 vs 127%), and mean weight at recapture (0.60 vs .55 kg).

Vincent (1972) who studied the effect of stocking domestic rainbow trout in the Madison River where a wild population already existed, reported that the hatchery stocking resulted in a reduction in total numbers of wild fish (49%) and total biomass (46%) within one year. Conversely, cessation of hatchery stocking in a second stream resulted in an increase in wild fish numbers (180%) and total biomass (186%) within one year. Vincent postulated that these changes in fish density were caused by complex interactions in the social behavior of wild and domestic fishes. The importance of fish behavior on fish growth and survival in natural environments was also discussed by Butler and Hawthorne (1968), Jenkins (1969), and Butler (1974).

Differences in the field performance of brook trout strains (wild, domestic, and interstrain hybrids) stocked as fingerlings in four ponds were demonstrated by Flick and Webster (1964, 1975, and 1976). The interstrain cross (domestic X Assinica) yielded the highest growth rate, survival, and total biomass of all the strains tested. In a comparison between the wild and domestic strains, the domestic strain yielded the faster growth and higher contribution to the fishery during the first fishing season, but was largely depleted from the fishery by the end of the second season; the wild strain yielded the higher survival and total biomass contribution to the fishery over the 5-year study period.

Ayles (1975), working with three strains of rainbow trout (two wild and one domestic) stocked as fingerlings in 12 central Canadian winterkill lakes and harvested at the end of one growing season, reported that growth of the domestic strain was superior to that of either wild strain in 2-years of the study. Survival from stocking to harvest was highest in 1972 for the domestic strain and in 1973 for the wild strain. Total fish production biomass was highest for the domestic strain in both years.

Significant differences between four strains of rainbow trout (Kamloop , Selected Growth, Washington, and Manchester) stocked as fingerlings in two South Dakota reservoirs was reported by Ford (1978). In the hatchery production phase, the Selected Growth strain grew 20% faster than the other three strains. Though the difference in size at the time of stocking favored the Selected Growth strain, fish of all strains were of equal length by the end of the first growing season. Creel census during the 2-year test period revealed that the total return was 32.5, 27.4, 23.6, and 15.7% for the Selected Growth, Kamloop, Washington, and Manchester strains, respectively. Ford pointed out that the ranking of the strains by survival was the same in both lakes (one oligotrophic and one eutrophic), except that the Selected Growth strain was first followed by the Kamloop in the oligotrophic lake, and the Kamloop ranked first followed by the Selected Growth strain in the eutrophic lake.

Dolan and Piper (1979) studied hatchery and field performances of four rainbow trout strains: Fish Lake and McConaughy which were natural strains that had been reared under hatchery conditions for two generations; and Standard Growth and Winthrop, which had long histories of maintenance in a hatchery environment. Hatchery production and field evaluation data divide these strains into two groups that demonstrate substantial differences.

Strain	Mean Weight (g) at age in days		Feed conversion	Recovery (%) By Fishing Season	
	147	364	factor	First	Total
Natural					
McConaughy	3.9	46	1.7	47	54
Fish lake	5.8	61	1.8	35	39
Domestic					
Standard Growth	7.2	95	1.5	69	70
Winthrop	6.7	100	1.4	63	64

The domestic strains (Winthrop and Standard Growth) had the faster growth rates and better feed conversion factors in the hatchery and higher first season and total recoveries; the natural strains (McConaughy and Fish lake) had the higher carryover from the first to second fishing season.

Attained weight during the field evaluation showed no growth rate differences between the four strains. Returns during the first fishing season revealed that the natural strains (McConaughy and Fish Lake) were captured in higher numbers by boat fishermen than the domestic strains (standard Growth and Winthrop). This recovery pattern suggests that the natural strains may have been more uniformly distributed through the pond than the domestic strains. When the study was repeated, similar performances were observed in hatchery production and return to the creel through the first fishing season (R.G. Piper, personal communication).

Protein Variants (Isozymes)

The use of protein variants to study the genetics of different fish populations has long been recognized as a valuable tool (Lewontin and Hubby 1966). Utter and Hodgins (1972), who found significant differences in gene frequencies at six different loci in four rainbow trout strains, suggested that these differences could be used simultaneously to construct unique genetic profiles that would characterize specific populations. The population profile would then allow researchers: (1) to characterize and identify specific strains; (2) to measure heterozygosity or inbreeding in domestic and "wild" strains; (3) to study physiological differences associated with specific isozymes and their relation to environmental factors; and (4) to study ecological and evolutionary relationships among trout strains. Utter et al. (1973), using this genetic profile approach, reported the relationship between five Pacific salmon and two trout species. The rainbow trout was the most genetically variable of the species studied and the authors suggested that this increased variability reflected the greater habitat diversity of the rainbow trout as compared with other salmonids.

Allendorf (1975) reported many strain differences among 32 variant loci in 38 populations of rainbow trout from the Pacific Northwest. Using genetic profiles to construct a dendrogram, he concluded that 33 populations fell into the "coastal group" of rainbow trout and 5 into an "inland group", found east of the Cascade Mountains. Within-strain genetic variation was also found among eight strains of winter spawning rainbow trout (Milner et al. 1979).

Methodology for using protein variants as genetic markers to identify individual populations or strains was developed relatively recently (Utter et al. 1973; Allendorf and Utter 1976; and Moav et al. 1976). The method basically involves identification of one or more variant alleles that occur at relatively low gene frequencies (0.50 to 0.15) within a specific population for use as marker genes. Once a specific marker allele is chosen, the target population is selectively bred to increase gene frequency of that allele to the point where it is distinctly different from all other populations in the fishery. Several different breeding schemes are available for imposing a selection system but usually the breeding system chosen should be imposed over a period of two or more generations to allow for broader sampling of the total gene pool and to minimize the potentially deleterious effects of inbreeding.

Meristic Traits

Variation in the expression of meristic traits has long been recognized in many fish species (Hubb 1922; Barlow 1961; and others). During the early 1970's a number of different investigators indicated that the factors controlling the expression of these traits included a large genetic-environmental interaction (Ricker 1972; Ali and Lindsey 1974; Lindsey 1975). Although meristic characters are valuable in the differentation of salmonid populations (Ricker 1972; Gill and Fish 1966), little information is available in the literature on genetic differences between strains reared concurrently in the same environment. MacGregor and MacCrimmon (1977a, 1977b) reported significant differences in dorsal, caudal, pectoral, and anal fin rays as well as in vertebral numbers in two strains of rainbow trout. No difference was found in number of pelvic fin rays.

Morphological examination of seven strains of rainbow trout reared under standardized environmental conditions revealed several small but significant strain differences in fin ray and vertebral counts (Kincaid unpublished data). Since the data were obtained from fish reared under standardized conditions, the means are expected to be relatively free of environmental variation, and should therefore measure true genetic differences between the strains. The frequency of vertebral abnormalities and fusions was relatively high in the domestic strains, but uniformly low in both natural strains and strain crosses. the highest frequencies of abnormalities and fusions were in two domestic strains that have long been maintained in the hatchery environment; probably these high frequencies reflect inbreeding.

The lower frequency in the strain cross produced from the two domestic strains with high frequencies of fusion, indicated that hybridization disrupted the high levels of homozygosity produced by inbreeding. The rate of natural vertebral fusion in these strains of rainbow trout appear to be from 3 to 5%.

Summary

This review of fish strain studies demonstrates that there are substantial performance differences between fish strains in a broad range of traits, such as growth, survival, feed conversion, disease resistance, tolerance to acid water, returns to the creel, age at maturity, and spawning period. General availability of strain trait information is important to the fishery manager because the decision to use a specific strain in a program can directly contribute to the success or failure of that program. Since little data has been available in the past on individual strain performances, managers have been forced to rely on their own experience and word-of-mouth exchange of information. This Trout Strain Registry brings together much of the available information on trout strain characteristics.

INFORMATION IN TROUT STRAIN REGISTRY

Tables in this registry have been divided into five sections corresponding to the five trout species--rainbow trout (Tables (tables 1-9), brown trout (tables 10-11),brook trout (tables 12-13), lake trout (tables 14-15), and cutthroat trout (tables 16-17). The registry is a composite of available information collected from several sources including the U.S. Fish and Wildlife Service Division of Hatcheries, U.S. Fish and Wildlife Service National Fishery Center - Leetown, and State Fish and Game Agencies.

The U.S. Fish and Wildlife Service Division of Hatcheries provided data on the trout strains and brood stocks held in the National Hatchery System -- table 1 (rainbow trout), table 10 (brown trout), table 12 (brook trout), table 14 (lake trout), and table 16 (cutthroat trout). Strain name, location of brood stock, disease classification, and spawning season of each brood stock are given for each strain.

State Fish and Game Agencies provided data on the trout brood stocks being used and maintained by the individual states via a questionaire provided by the National Fishery Center-Leetown during 1980. The spawning season, broad stock type, breeding population size, origin, and current management use for each brood stock is summarized in table 2 (rainbow trout), table 11 (brown trout), table 13 (brook trout), table 15 (lake trout), and table 17 (cutthroat trout).

The U.S. Fish and Wildlife Service Fish Genetics Laboratory, Beulah, Wyoming conducted a rainbow trout strain evaluation program to characterize existing strains of rainbow trout for a variety of cultural and non-cultural traits in 1974-1979. A primary objective of that program was to evaluate strains and compile the characterization information into a form that would be readily available to fishery managers for use in the identification of the specific strains best suited for a particular management situation. Rainbow trout strain information contained in tables 3-9 was summarized from the Fish Genetics Laboratory strain evaluation program.

Table 3 lists the rainbow trout strains included in the Fish Genetics Laboratoy strain evaluation program and provides information of strain identification number, source of strain, date introduced into the program, spawning season, and test evaluations completed on each strain. A discription of each category of testing and the table where that strain information has been summarized, is given below.

Performance testing in a standardized rearing environment for one generation from fertilized egg to sexual maturity (non growth traits, Table 4; growth traits, Table 5). Strains were introduced to the Fish Genetics Laboratory as eyed eggs and reared to sexual maturity. At 3 years of age, the test fish were produced by mating individual pairs to yield a series of half-sib families in a nested or hierarchical design. Mating pairs were randomly selected from all mature adults available on the spawning date. A total of 40 to 160 families were reared separately and the composite performance was used to characterize the strain. Environmental characteristics of the test environment follow: water temperature, 11 ± 1°C; pH, 7.6-7.8; water hardness, 426 ppm as $CaCO_3$ and 634 ppm total hardness; and oxygen content, saturation (about 9 ppm) at point of introduction. Eggs were incubated in Heath-type vertical overflow incubation units. Fry were reared from swim-up to 147 days in 17.2 liter polyethylene circular units with an inflow of 2.3 liter of oxygen saturated water per minute.

From 147 days to 1 year, fish were reared in circular fiberglass tanks (1.2 m in diameter) inside the hatchery building with water inflows of 15.1 liter/min. Fish were fed six times daily until they reached an age of 147 days, three times daily from 148 to 364 days, and twice daily thereafter. Total daily feed was calculated by the method of Buterbaugh and Willoughby (1967). Hatchery constants 20% larger than those prescribed by these authors were used to insure that ample feed was available for full expression of inherent growth potential. Feeding rate was adjusted weekly during the first year and monthly thereafter on the basis of actual weighings or (between weighings) growth projections.

The numbers of fish per tank were standardized by random reduction to 300 fry at swim-up, 150 fish at 105 days, 110 at 147 days and 100 at 364 days. Traits measured in this segment of the program included fecundity, hatchability, fry viability, growth rate, feed conversion, age to 203 mm (8 in.), weight at maturity, and age at sexual maturity. Comparison of strains under these test conditions showed substantial differences in many of the traits measured; however, specific performance characteristics that would be obtained under other production situations or environments are not predicted.

Morphology profile (Tables 6). The morphology profile was obtained by x-ray examination; dorsal, pectoral, pelvic, and anal fin rays and number of vertebrae were counted. The frequency of vertebral fusions and abnormalities was also determined. Samples from each strain consisted of either 1) 20 fish from each family in the test generation for a total of 500 to 3,000 fish per strain, or 2) a sample of 100 fish drawn randomly from a multi-family pool. Differences between strains are interpreted as genetic differences, because all fish were reared concurrently in the same environment, or if reared in different years the data were adjusted for year-to-year environmental variation based upon annual performance of the control lines.

Field testing in pond (Tables 7). The test pond was a 1.0-ha. spring-fed pond at the Fish Genetics Laboratory. The pond was supplied with spring water at the rate of 17,000 liters/min. Large quantities of amphipods (*Gammarus* sp.) provided the predominant food supply, supplemented by insects and their aquatic larvae. No supplemental feed was provided to the fish after initial stocking in the pond. Fish were stocked as fingerlings about 7 months old and evaluated during three consecutive recovery periods after the fish had been in the pond for 6, 12, and 18 months.

Test fish were individually weighed and identified by stainless steel tags implanted in the body cavity about 3 weeks before they were planted. Fish were stocked with an existing population that varied from 700 to 2,000 fish 1 year old or older.

Recovery periods consisted of a 2-week period of public fishing (about 1000 rod hours) and 5 days of gillnetting (about 100 h). Four experimental gillnets, 30 m long, were positioned in the pond and checked daily to remove fish. Each fish was identified and weighed at the time of recovery.

Strain information gained from this test situation included relative growth rate, return rate, survival, and susceptibility to angling in the tested environment.

Biochemical profile (Tables 8 and 9). Strains were characterized for biochemical traits by starch gel electrophoresis. A sample of about 100 fish drawn randomly for each strain was processed by established procedures described by Allendorf et al. 1975; May 1975, 1980, and others). Gene frequencies and standard errors were measured for each allele at each locus and heterozygosity levels were calculated for each strain. Strain differences were measured by examination of gene frequency patterns at each locus separately.

Hatchery production testing in cooperation with national hatchery system (Table 9). Fish strains were provided to participating hatcheries as eyed eggs. The hatchery then reared the test lot to a catchable size (203 cm or 8 in.), using its own standard methodology. A problem recognized early in the program was the existence of large hatchery effects (wide range in water temperature, water quality, rearing units, etc.) that could completely mask strain differences. The problem was corrected by the use of at least two production lots at each hatchery, one lot being a control. The control lot enabled the measurement of the relative strain performance by the removal of hatchery effects from test lot performance. Efficiency of the test was increased further during 1979 when testing was expanded to include 4 to 10 test lots (one control lot with 3 to 9 test lots) at each hatchery, one lot being a control common to all test stations.

METHOD FOR OBTAINING SEED STOCK

The trout strains identified in this registry are maintained by the individual state fish hatchery, National Fish Hatchery, or National Fishery Research Laboratory to meet their own management objectives. The fact that a strain or brood stock is described in this Trout Strain Registry does not imply that seedstocks will or will not be made available to other organizations. Individuals or orgainizations that wish to obtain a specific strain from a specific source will need to contact the appropriate organization and determine the availability of fish or eggs and the current disease classification.

Rainbow trout strains evaluated in the fish genetics strain evaluation program were moved to the Leetown National Fishery Center, Kearneysville, West Virginia, in 1980. This facility now maintains these strains for the U.S. Fish and Wildlife Service.

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Table 1 Rainbow trout strains being maintained in U.S. Fish and Wildlife Service National Hatchery System August 1981.

Strain	Hatchery NFRL=National Fishery Research Laboratory	Disease Classification[a]	Spawning Period
Accelerated Growth	Leetown NFRL, WV	B-(BK-BR)	October-November
Accelerated Growth	Spearfish, SD	B-BK-(BR)	October-November
Talarik	Leetown NFRL, WV	B-(BK-BR)	January-February
Talarik	Spearfish, SD	B-BK-(BR)	January-February
Arlee	Ennis, MT	A-2	November-December
Beulah	Wytheville, VA	B-BF	January-February
Cortland	Tunison NFRL, NY	A-2	October-November
Crystal River	Erwin, TN	B-(BF)	December-February
Desmet	Leetown NFRL, WV	B-(BK-BR)	January-February
Donaldson	Leetown NFRL, WV	B-(BK-BR)	January-February
Eagle Lake	Creston, MT	A-2	February-March
Ennis	Leetown NFRL, WV	B-(BK-BR)	January-February
Erwin	Ennis, MT	A-2	July-September
Erwin	Erwin, TN	B-(BR)	August-September
Erwin	Tunison NFRL, NY	A-2	March
Fish Lake	Leetown NFRL, WV	B-(BK-BR)	January-February
Fall Formalin Resistant	Leetown NFRL, WV	B-(BK-BR)	October-November
Fall Formalin Resistant	Spearfish, SD	B-BK-(BR)	October-November
Winter Formalin Resistant	Leetown NFRL, WV	B-(BK-BR)	January-February
Winter Formalin Resistant	Spearfish, SD	B-BK-(BR)	January-February
Kamloop	Ennis, MT	A-2	March
Manchester	Leetown NFRL, WV	B-(BK-BR)	October-November
McConaughy	Ennis, MT	A-2	January-March
McConaughy	Leetown NFRL, WV	B-(BK-BR)	January-February
New Zealand	Leetown NFRL, WV	B-(BK-BR)	January-February
Red Band	Ennis, MT	A-2	March
Sand Creek	Leetown NFRL, WV	B-(BK-BR)	January-February
Shasta	Ennis, MT	A-2	February-March
Shasta	Erwin, TN	B-(BF)	March

Table 1 Rainbow trout strains being maintained in U.S. Fish and Wildlife Service National Hatchery System August 1981. (Continued)

Strain	Hatchery NFRL=National Fishery Research Laboratory	Disease Classification[a]	Spawning Period
Fall Standard	Leetown NFRL, WV	B-(BK-BR)	October-November
Fall Standard	Spearfish, SD	B-BK-(BR)	October-November
Winter Standard	Leetown NFRL, WV	B-(BK-BR)	January-February
Winter Standard	Spearfish, SD	B-BK-(BR)	January-February
Utah	Erwin, TN	B-(BF)	April-May
Wigwam	Leetown NFRL, WV	B-(BK-BR)	November-December
Winthrop	Bozeman, MT	B-BK	January
Winthrop	Leetown NFRL, WV	B-(BK-BR)	January-February
Winthrop	Walhalla, SC	B-BF-VP-BK	January-March
Wytheville	Leetown NFRL, WV	B-(BK-BR)	October-November
Wytheville	Bowden, WV	B-BF-VP-BK	August-September
Wytheville	Erwin, TN	B-(BF)	October-December
Wytheville	Norfork, AR	B-(BK)-VP	January-May, August-September
Wytheville	White Sulphur Springs, WV	A-1	October-December
Wytheville	Wytheville, VA	B-BF	July-October

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[a] Disease Classification: A-1=hatchery has a closed water supply that is free of fish and has been free of certifiable disease for a period of two years; A-2=hatchery has an open water supply or a closed water supply harboring fish and a two year history of being free of certifiable diseases; B=hatchery that has had one or more of the certifiable diseases within the past two years; BF=furunculosis; BK=bacterial kidney disease; BR=enteric redmouth; SC=*Ceratomyxa shasta*; VP=infectious pancreatic necrosis; VH=viral hemorrhagic septicemia; SBK=suspected bacterial kidney disease. Disease symbols include within a parenthetical are suspected of being diseased.

Table 2 Rainbow trout brood stocks maintained by State Fish and Game Departments in 1980[a]. (Abbreviations brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses).

State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Alaska						
KLAWOCK Klawock SFH		100	N	Klawock River, Alaska	OS	Steelhead used for smolt stocking in the Klawock River.
KETCHIKAN Deer Mountain Ketchikan		100	N	Ketchikan Creek, Alaska	OS	Steelhead used for smolt stocking into streams.
SWANSON Ship Creek SFH, Anchorage		3000+	M	Swanson River, Alaska	PTL,FL	
TALARIK Ship Creek SFH		100	D	Talarik River Alaska	PTL,FL	
California[a]						
MT. WHITNEY			D	Mixture of rainbow, steelhead, and Lahontan cutthroat trout developed in 1900-70.		
VIRGINIA			D	Introduced from Wytheville (Virginia) NFH in 1971.		

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State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
California Continued						
HOT CREEK			D	Introduced from hatchery in Springville (Utah) hatchery in 1933 and crossed with Mt. Whitney strain in 1952-53.		
DAVIS			D	Developed from cross between Hot Creek and Virginia strains in 1968; brood stock was selected for growth, egg size, and egg number for four generations.		Expected to replace the Virginia strain in the California Hatchery System.
MT. SHASTA			D	Developed from cross between Hot Creek and a strain from the Meader (California) Trout Farm in 1950-52.		

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State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
California Continued						
COLEMAN			D	Introduced from Coleman (California) NFH, in 1968. Later crossed to resident rainbow (from Battle Creek, California) and steelhead.		
PIT RIVER				Developed from native Pit River rainbow trout in 1968-70.		Resistant to *Ceratomyxa shasta*.
EAGLE LAKE				Introduced from Eagle Lake, representing the subspecies *Salmo gairdneri* aquilarum.		Does not spawn in the lake and its tributaries; maintained by stocking with hatchery-reared Eagle Lake fish.
JUNCTION KAMLOOPS				Introduced from Diamond Lake (Oregon) in 1954 and established in Junction Reservoir, Mono County, California.		

Table 2 Rainbow trout brood stocks maintained by State Fish and Game Departments in 1980[a]. (Abbreviations brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Colorado						
ARLEE Bellvue Research Hatchery	Oct-Dec	3000+	D	Multiple introductions from the same unidentified source.	PTS,PTL, FS,FL	
BELAIRE Crystal River Brood Unit, Carbondale	Oct-Nov	3000+	D	Multiple introductions from different sources.	PTS,PTL, FS,FL	
TASMANIAN Crystal River Brood Unit, Carbondale	Dec-Feb	3000+		Multiple introductions from the same unidentified source.	PTS,PTL, FS,FL	
HARTMAN Durango Brood Unit	Nov-Jan	3000	D	Multiple introductions from the same unidentified source.	PTS,PTL, FS,FL	
Connecticut						
NASHUA BY BEULAH CROSS Quinebaug, SFH		500	D	Cross between domestic fish at Quinebaug in 1978.	PTS,PTL	

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State[b/] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Connecticut Continued						
WHITE SULPHUR Quinebaug		500	D	Single introduction of domestic fish from White Sulphur Springs (West Virginia) NFH in 1974.	PTS,PTL	
NASHUA Quinebaug		1000	D	Single introduction of domestic fish in 1970. Source was not identified.	PTS,PTL	
KAMLOOPS Quinebaug		250	D	Single introduction of domestic fish from Trout lodge (commercial brood stock), McMillin (Washington) in 1976.	PTS,PTL	
BEULAH Quinebaug SFH		250	D	Single introduction of domestic fish from Fish Genetics laboratory, 1976.	PTS,PTL	

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State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Connecticut Continued						
KAMLOOPS Burlington SFH		100	D	Single introduction of domestic fish from Trout Lodge (commercial strain), McMillin (Washington) 1977.	PTS,PTL	
Idaho						
NO NAME Hayspur SFH, Bellevue		3000+	D	Multiple introductions from different sources.	PTS,PTL, FL,OS	Average percent of eggs eyed, 88-90 in 1966-79.
NO NAME American Falls SFH		3000	D	Unknown	PTS,PTL, PS,FL	
Iowa						
NO NAME Manchester SFH	Sep-Oct	500		Obtained from Nevin (Wisconsin) SFH 1972.	PTS	Disease resistant, growth rate of .051 mm/day in 10°c water.
Michigan						
MICHIGAN RAINBOW Oden SFH		1000	D	Unknown	PS,FL, OS	Non-migratory, fast-growing.

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State[b/] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Minnesota						
MADISON Lanesboro SFH		250	D	Obtained from Madison (Wisconsin) SFH in 1957.	PTL,PTS, FS,FL, OS	
ERWIN Lanesboro SFH		3000	D	Obtained from Erwin (Tennessee) NFH in 1978.	PTL,PTL, FS,FL, OS	
JOCO RIVER Lanesboro SFH		3000	D	Obtained from Arlee (Montana) SFH	PTS,PTL, FS,FL, OS	
Missouri						
SHEPHERD OF THE HILLS Shepherd of the Hills SFH, Branson	Oct-Dec	1000+	D	Introductions from McCloud River Station, 1880-86.	PTS,PTL, FL	Possible resistance to kidney disease. Females produce 1650-1800 eggs/kg. Maximum size between 7-8 kg, excellent growth rate.
DONALDSON Shepherd of the Hills SFH, Branson	Mar-Apr	1000+	D	Single introduction from Crawford (Nebraska) NFH in 1973.	PTS,PTL	Possible resistance to kidney disease. Strain is susceptible to bacterial gill disease and fin rot as compared to other Missouri strains. Females produce 2800-3300 eggs/kg. Adults reach maximum size of 7-8 kg in Missouri.

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State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Missouri Continued						
BENNETT SPRING Bennett Spring SFH, Lebanon	Oct-Nov	500	D	Introductions from McCloud River Station in 1880-86.	PTS	Possibly resistant to kidney disease. Females produce 1900-2000 eggs/kg. Maximum size, 4-6 kg.
ROARING RIVER Roaring River SFH, Cassville	Sep-Oct	250+	D	Introduction from McCloud river Station in 1800-86.	PTS	Possibly resistant to furunculosis. Females produce 1750-2200 eggs/kg. Maximum size, 4-6 kg. Excellent growth rate.
Montana						
ARLEE Jocko River SFH, Arlee	Aug 15-Dec 15	1000	D	Cross between Donaldson and an unidentified Missouri strain in 1955.	PTS, PTL, FL	Grow to 1.1-1.4 kg in lakes and reservoirs in two years, return to creel is excellent.
Nebraska						
MCCONAUGHY Rock Creek SFH	Spring Mar-Apr	500	N	Spawn from migratory Lake McConaughy adults maintained by eggs taken from wild population.	FS, FL	Migrate up lake McConaughy tributaries for spawning in late fall or spring, at age II or age III. Juveniles smolt and move downstream in the spring at age I. The strain is relatively nonsusceptible to angling.

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State[b/] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
New Jersey						
HACKETTSTOWN EARLY RAINBOW Hackettstown SFH	Jul 20-Sep	3000	D	Multiple introductions from different sources, including Petersburg (Virginia), Bangor (Pennsylvania), and commercial stock crossed to Wytheville NFH stock.	PTS,PTL	Selected for early spawning without light manipulation for 15-20 years; brood stock has several recurrent diseases.
HACKETTSTOWN RAINBOW Hackettstown SFH	Oct-Nov	3000	D	Single introduction of domestic fish from Plymouth, Massachusetts, during the 1950's.	PTS,PTL	Brood stock has several recurrent diseases; originally spawned in December-January.
New Mexico						
PARKVIEW-SPRING Parkview SFH	Mar-May	3000	D	Not specified	PTS,PTL, FS,FL, OS	More than 90% eggs eyed; less than 10% fry deformed; feed conversion 1.5-1.9.
PARKVIEW-FALL Parkview SFH	Sep-Jan	3000	D	Not specified	PTS,PTL, FS,FL, OS	More than 90% eggs eyed; less than 10% fry deformed; feed conversion 1.4-1.8; high tolerance to transportation stress.

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State[b/] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
New York						
CALEDONIA Caledonia SFH	Oct-15 Dec 1	1000	D	Multiple introductions from different sources.	PTL,OS	Tolerant to low oxygen; average growth; 60-70% of eggs eyed; reasonably good disease resistance to bacterial pathogens; low sperm activity; some incidence of deformed fry.
MICHIGAN Caledonia SFH	Aug-Oct	3000	D	Introduced from Harrietta (Michigan) SFH. Michigan received brood stock from Wisconsin in 1964.	PTL,OS	Early spawning; hatch 60% in first spawning season and 80% in second; fast growth; tendence toward dorsal fin erosion; sperm activity high; growth and vigor of fry and fingerlings good.
North Carolina						
1 RTL 8 Armstrong SFH, Marion	Oct 15-Dec 15	1000	D	Introduced of eggs from Trout Lodge (commercial strain) McMillin, Washington.	PTs,PTL, FS,FL	

Table 2 Rainbow trout brood stocks maintained by State Fish and Game Departments in 1980[a]. (Abbreviations brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Ohio						
LONDON (1974) London SFH		800	D	Introductions from Bowden NFH, Manchester NFH, and Shepherd of the Hills (Missouri) SFH.	PTS,PTL, FS,FL, OS	Tolerant to high water temperatures, (24°c), poor water quality, and low dissolved oxygen; feed conversion 1.2-1.4; good growth rate.
LONDON (1980) London SFH		500	D	Crossing of London (1974) to Golden Rainbow to obtain palomino (1976). Palomino (1976) was then backcrossed to London (1974) to obtained London (1980).	PTS,PTL, FS,FL	Strain is tolerant to warm water temperatures (24°c), poor water quality, and low dissolved oxygen; feed conversion 1.1-1.2; excellent growth.
Oregon						
ROARING RIVER Roaring River SFH	Fall	1000+	D	Single introduction of domestic fish from W.S. Meador Trout Farm (Idaho) in 1937.	PTS,PTL	Originally known as the "Utah" brood stock.

Table 2 Rainbow trout brood stocks maintained by State Fish and Game Departments in 1980[a]. (Abbreviations brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Oregon Continued						
CAPE COD RAINBOW Roaring River SFH		700	D	Single introduction of domestic fish from Washington in 1967; transferred to Washington in 1941 or 1942 from Cape Cod (Massachusetts) SFH.	PTS	
WILLAMETTE RAINBOW Willamette SFH	Spring	5000	D	Single introduction of domestic fish from McKenzie (Oregon) SFH in 1952. Originated from native McKenzie resided trout, but may have included some fall spawning fish from the Roaring River brood stock.	PTS,PTL	
OAK SPRINGS RAINBOW Oak Springs SFH	Fall	3000+	D	Multiple introductions from different sources.	PTS,PTL	
NATIVE DESCHUTES RAINBOW Oak Springs SFH	Spring	250	D	Single introduction of wild fish from Deschutes River in 1970.	FL	Resistant to *Ceratomyxa shasta*.

Table 2 Rainbow trout brood stocks maintained by State Fish and Game Departments in 1980[a]. (Abbreviations brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Oregon Continued						
EAGLE LAKE Klamath SFH	Spring	500	D	Single introduction of wild fish from Eagle Lake, California, in 1970.	PTL	Adapted to alkaline waters of of southeastern Oregon; also known as "California" rainbow.
REDBAND Pansnip Reservoir Oregon		1000	N	Single introduction of wild fish from Three Mile Reservoir, Oregon, in 1977.		Native to Three Mile Reservoir, where brood fish were originally spawned to begin the program. The 1980 egg take was the first from hatchery-reared fingerlings stocked in Pansnip Reservoir.
Pennsylvania						
REYNOLDSDALE Reynoldsdale, Huntsdale, and Bellefonte SFH	Aug 17-Sep 25	3000+	D	Introduction from Wytheville, West Virginia, and Plymouth, Massachusetts, during the 1940's.	PTS,PTL	
BENNER SPRING SYNTHETIC Spring Creek SFH	Aug 17-Sep 25	3000	D	Synthetic strain produced by crossing various strains in 1974.	PTS,PTL	Strain developed to increase genetic variability for possible selection programs.

Table 2 Rainbow trout brood stocks maintained by State Fish and Game Departments in 1980[a]. (Abbreviations brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
South Dakota						
GROWTH 104-76 Cleghorn Spring SFH, Rapid City	Oct-Nov	250	D	Introduced from Fish Genetics Laboratory, Beulah, Wyoming, in 1975.	FL	Fast growth in hatchery. Excellent food conversion and good return to the creel over a long period; thus adaptable for stocking as fingerlings.
KAMLOOPS 107-76 Cleghorn Spring SFH, Rapid City	Oct-Nov	250	D	Introduced from Trout Lodge (commercial source) McMillin, Washington, in 1975.	FL	Average growth in hatchery; good food conversion, color, and growth after stocking; good return to the creel over a long period after stocking.
Tennessee						
DOE CREEK Buffalo Spring SFH, Rutledge		250	M	Introduction of wild fish from Watauga Lake in 1974.	PTL	Self-sustaining; migratory between Watauga Lake and the tributary Doe Creek.
TASMANIAN Buffalo Spring SFH, Rutledge		250	D	Introduction from Tasmania, Australia in 1976.	PTL	Superior recovery rates.
Utah						
SAND CREEK Egan SFH, Bicknell	Sep-Nov	3000+	D	Introduced from Fish Genetics Laboratory Beulah, Wyoming, in 1971.	PTS, PTL, FL	Eggs smaller than those of other rainbow trout at each age. Fish feed well in hatchery and yield good growth.

Table 2 Rainbow trout brood stocks maintained by State Fish and Game Departments in 1980[a/]. (Abbreviations brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b/] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Utah Continued						
SHEPHERD OF THE HILLS Egan SFH, Bicknell	Nov-Jan	3000	D	Introduction from Shepherd of the Hills Hatchery, Branson, Missouri, in 1970.	PTS,PTL, FL	Fish feed well and have good growth.
TENSLEEP Egan SFH, Bicknell	Nov-Jan	3000	D	Introduction from Wigwam SFH, Tensleep, Wyoming, in 1971.	PTS,PTL, FL	Spawning mortality and percent deformed fry are above average.
FISH LAKE-DESMET Egan SFH, Bicknell	Feb-Apr	3000	D	Developed from cross Fish Lake and Desmet Lake strains in 1971 and 1972. (Parent strains were introduced from the wild in 1967.)	PTS,PTL, FL	Good hatchery performance, average to above average feed conversion.
DESMET Egan SFH, Bicknell	Dec-Feb	1000	D	Introduced from Story (Wyoming) SFH in 1975.	FL	Fry do not readily begin feeding, and are slow growing. A very vigorous fish.
ALBINO Egan SFH, Bicknell	Dec-Jan	1000	D	Introduced from Ennis (Montana) NFH in 1967.	PTL	Eggs are pale yellow to yellowish-orange color. Very Hardy, more disease resistant than average. Strain has above average frequency of deformed fry.

Table 2 Rainbow trout brood stocks maintained by State Fish and Game Departments in 1980[a/]. (Abbreviations brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b/] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Virginia						
WYTHEVILLE Marion SFH	Jul-Sep	18,000	D	Wytheville (Virginia) NFH.	FS,FL	Has been selected for early (summer) spawning. About 4 million eggs produced annually. Somewhat resistant to infectious pancreatic necrosis.
Washington						
MT. WHITNEY Tokill Creek SFH	Dec-Mar		D	Single introduction of domestic fish from Mt. Whitney Hatchery (California) SFH.	PTS,OS	
GOLDENDALE Goldendale SFH	Oct-Dec	3000+	D	Multiple introductions from different sources.	PTS,PTL, OS	
SPOKANE Spokane SFH	Nov-Dec	3000+	D	Single introduction of domestic fish from Cape Cod Trout Co., Wareham, Massachusetts, in 1942.	PTS,PTL, OS	
SOUTH TACOMA South Tacome SFH	Aug-Oct	3000+	D	Multiple introductions from different sources (Meador Trout Farm, Pocatello, Idaho).	PTS,PTL, OS	

Table 2 Rainbow trout brood stocks maintained by State Fish and Game Departments in 1980[a]. (Abbreviations brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Washington Continued						
SKAMANIA STEELHEAD Skamania SFH	Summer run	3000	M	Multiple introductions from different sources (mixture of Washougal River and Klickitat River steelhead).	OS	Adults return after 2 or 3 years in ocean; a noncaptive brood stock.
CHAMBERS CREEK STEELHEAD South Tacoma SFH	Winter run	3000	D	Multiple introductions from different sources (nearly Pure Chambers Creek stock).	OS	Adults return after 18 months in ocean; a nonocaptive brood stock.
West Virginia						
WEST VIRGINIA Spring Run SFH, Dorcas		3000	D	Introduced from White Sulphur Springs (West Virginia) NFH in 1949.	PTS,PTL	
WEST VIRGINIA BICENNTENNIAL GOLDEN TROUT Spring Run SFH, Dorcas		3000	D	Introduction of rainbow trout from White Springs (West Virginia) NFH in 1949.	PTS,PTL	Developed by selection for golden color mutant and accelerated growth rate.

Table 2 Rainbow trout brood stocks maintained by State Fish and Game Departments in 1980[a]. (Abbreviations brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Wisconsin						
SHASTA Osceola SFH	Spring		D	Single introduction of domestic fish as eyed eggs from California Fish and Game Department (Mt. Shasta SFH) in 1979.	PTS,PTL, FS,FL	
NO NAME Osceola SFH	Dec-Jan	1000	D	Single introduction from the state of Washington during early 1960's.	PTS,PTL, FS,FL	Disease free. Spawns at 3 and 4 years of age.
Wyoming						
KEMMERER CITY RESERVOIR Kemmerer City Reservoir Lincoln County	Spring	1000	N	Single introduction from Lake Desmet, northeastern Wyoming.	OS	
KEMMERER CITY RESERVOIR Boulder SFH Boulder	Spring	3000	D	Single introduction from Kemmerer City Reservoir, Lincoln County in 1959.	PTS,PTL, FS,FL	

Table 2 Rainbow trout brood stocks maintained by State Fish and Game Departments in 1980[a]. (Abbreviations brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
WIGWAM SPRING RAINBOW Wigwam SFH Tensleep	Spring	3000+	D	Multiple introductions from Lake Desmet.	FL	
Wyoming Continued						
WIGWAM FALL RAINBOW Wigwam SFH Tensleep	Oct 15-Dec 15	3000+	D	Single introductions from Bothell, Washington (commercial hatchery) in 1956.	PTS,PTL, FS,FL	
LAKE DESMET RAINBOW Story SFH	Apr	3000+	M	Multiple introductions during late 1920's; source not positively known.	PTS,PTL FL	Wild fish in Lake Desmet move into Shell Creek to spawn during April (4-8 million eggs are collected annually).

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[a] Brood stock information taken from questionaires completed by State Fish and Game Departments during 1980. States reporting rainbow trout brood stocks are listed in the body of this table.

[b] Locality (city) shown separately when it is not included in the name of the hatchery.

Table 3 Rainbow Trout Strains Evaluated in the Characteristics Program (1974-79) at the U.S. Fish and Wildlife Service Fish Genetics Laboratory, Beulah, Wyoming[a].

Strain Number	Strain Common Name	Source[b]	Date Introduced	Fish Type at Introduction	Spawning Periods	Information Available: Standard Environment	Information Available: Biochemical Profile	Information Available: Morphology Profile	Information Available: Hatchery Production	Information Available: Field Performance
10	Fish Lake	Fish Lake, Utah	Jun 1973	Natural	Jan-Feb	X	X	X	X	X
11	Wytheville	Ennis, Montana, NFH	Aug 1973	Domestic	Sep-Nov	X	X	X		X
12	Manchester	Manchester, Iowa, NFH	Oct 1965	Domestic	Sep-Nov	X	X	X	X	X
13	New Zealand	McNenny, S. Dakota, NFH	Jan 1965	Native	Jan-Feb	X	X	X	X	X
14	Sand Creek	McNenny, S. Dakota, NFH	Jan 1965	Domestic	Jan-Feb	X	X		X	X
15	Standard-F	Developed at FGL 1971-73		Domestic	Sep-Nov	X		X	X	X
16	Standard-W	Developed at FGL 1971-73		Domestic	Dec-Feb	X	X	X	X	X
17	Growth-3F	Developed at FGL 1968-74		Domestic	Sep-Oct	X	X	X	X	X
18	McConaughy	State of Wyoming	Jan 1974	Native	Jan-Feb	X		X	X	X
19	Talarik	State of Alaska	May 1974	Native	Jan-Feb	X	X			

Table 3 Rainbow Trout Strains Evaluated in the Characteristics Program (1974-79), at the U.S. Fish and Wildlife Service Fish Genetics Laboratory, Beulah, Wyoming[a]. (Continued)

Strain Number	Strain Common Name	Source[b]	Date Introduced	Fish Type at Introduction	Spawning Periods	Information Available: Standard Environment	Information Available: Biochemical Profile	Information Available: Morphology Profile	Information Available: Hatchery Production	Information Available: Field Performance
20	Desmet	State of Wyoming	Apr 1975	Natural	Jan-Feb	X	X	X	X	
21	Wigwam	State of Wyoming	Oct 1976	Domestic	Nov	X				
22	Winthrop	Bozeman, Montana, FCDC	Jan 1977	Domestic	Dec-Feb	X			X	
23	Ennis	Ennis, Montana NFH	Feb 1977	Domestic	Sep-Oct	X			X	
24	Donaldson	WFNL	Jan 1968	Domestic	Dec-Feb	X				
25	Formalin resistant	Developed at FGL 1968-72		Domestic	Sep-Oct	X	X		X	
26	Formalin resistant	Developed at FGL 1968-72		Domestic	Dec-Feb	X	X	X	X	X
27	Kamloops	Spring Creek Trout Hatchey, Montana	Feb 1978	Domestic	Jan-Feb	X	X	X		
28	Soap Lake	Saratoga, Wyoming, NFH	Nov 1978	Domestic	Oct-Nov	X			X	

Table 3 Rainbow Trout Strains Evaluated in the Characteristics Program (1974-79), at the U.S. Fish and Wildlife Service Fish Genetics Laboratory, Beulah, Wyoming[a]. (Continued)

Strain						Information Available				
Number	Common Name	Source[b]	Date Introduced	Fish Type at Introduction	Spawning Periods	Standard Environment	Biochemical Profile	Morphology Profile	Hatchery Production	Field Performance
29	Erwin	Erwin, Tennessee, NFH	Nov 1978	Domestic	Sep-Nov	X				
30	Soap Lake	Saratoga, Wyoming, NFH	Jan 1979	Domestic	Dec-Feb	X			X	
31	New Zealand	Saratoga, Wyoming, NFH	Jan 1979	Domestic	Dec-Feb	X				
32	Growth-6F1	Developed at FGL 1968-78		Domestic	Sep-Oct	X				
33	Growth-6F2	Deveoped at FGL 1968-79		Domestic	Sep-Oct	X			X	
34	Growth-6W1	Developed at FGL 1968-79		Domestic	Dec-Feb	X			X	X

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[a] The Fish Genetics Laboratory was closed in June 1980. The Rainbow Trout Strains were transferred to the National Fisheries Center at Leetown, West Virginia.

[b] FCDC=Fish Cultural Development Center; FGL=Fish Genetics Laboratory; NFH=National Fish Hatchery; WFNL=(former) Western Fish Nutrition Laboratory, Cook, Washington.

Table 4 Performance of 1977, 1978, and 1979 year Classes of Rainbow Trout Strains in Standard Environment at Fish Genetics Laboratory (Non-Growth Traits).

Strain[a/] and Year class	Hatch (%)	Deformed fry (%)	Fingerling survival (%)	Feed conversion 84-147 days	Feed conversion 148-364 days	Spawning period	Maturity (years)	Precocious males (%)
10								
1977	71.6	3.2	87.7	2.1	1.7	JAN	2-3	
1978	53.6	3.3	86.1	2.5		JAN	2-3	8.7
1979	73.1	3.0	80.9	2.1				
11								
1977		2.4	92.6	1.7	1.4	SEP-OCT	2	
1978	45.9	5.3	93.4	1.6		SEP-NOV	2	0.0
1979	26.5	10.0	80.1	2.1	1.5			0.0
12								
1977		1.9	97.0	1.7	1.4	SEP-OCT	2	
1979	23.1	14.6	84.0	1.6	1.5			0.0
13								
1977	76.5	2.5	77.2	2.5	1.8	JAN	2-3	
1978	78.2	0.6	86.5	2.2		JAN	2-3	1.9
1979	58.3	3.6	55.4	2.1				
14								
1977	76.6	2.5	86.9	2.4	1.7	JAN	2-3	
1978		4.0	88.1	2.1		JAN	2-3	2.0
1979		5.1	71.9	2.6				
15								
1977	67.6	3.3	90.1	1.4	1.4	SEP-NOV	2-3	8.4
1978	53.8	4.4	76.3	1.8	1.9	SEP-NOV	2-3	4.5
1979	62.7	5.3	90.0	1.6	1.5			

Table 4 Performance of 1977, 1978, and 1979 year Classes of Rainbow Trout Strains in Standard Environment at Fish Genetics Laboratory (Non-Growth Traits). (Continued)

Strain[a/] and Year class	Hatch (%)	Deformed fry (%)	Fingerling survival (%)	Feed conversion 84-147 days	Feed conversion 148-364 days	Spawning period	Maturity (years)	Precocious males (%)
16								
1977		3.7	71.5	2.2	1.7	DEC-FEB	2-3	2.0
1978	64.2	3.4	87.6	1.9	1.7	JAN-FEB	2-3	2.1
1979	68.9	2.4	87.3	1.7				
17								
1978	48.1	5.8	79.8	1.7		SEP-OCT	2	7.2
1979		6.8	86.9	1.6	1.6			4.6
18								
1977	80.0	2.4	83.3	2.5	2.0	JAN-FEB	2-3	1.2
1978			78.9	2.8		JAN-FEB	3	1.9
1979			48.4	2.0				
19								
1978	36.8	7.4	83.3	3.4		DEC-FEB	3-4	3.3
1979	66.4	3.4	64.6	2.1				
20								
1977	93.8	1.2	89.9	1.7	1.7	JAN	2-3	
1978	69.0	1.3	85.1	2.4	2.1	JAN	2-3	2.9
1979	55.3	3.0	40.5					
21								
1977			89.7	1.7	1.4	NOV-DEC	2	1.5
1979	49.2	3.8	83.7	1.5				0.0
22								
1977			87.7	1.7	1.5	DEC-JAN	2	0.4
1979	71.0	4.5	68.9	2.3				

Table 4 Performance of 1977, 1978, and 1979 year Classes of Rainbow Trout Strains in Standard Environment at Fish Genetics Laboratory (Non-Growth Traits). (Continued)

Strain[a/] and Year class	Hatch (%)	Deformed fry (%)	Fingerling survival (%)	Feed conversion 84-147 days	Feed conversion 148-364 days	Spawning period	Maturity (years)	Precocious males (%)
23								
1977			73.9	1.9	1.6	JAN-FEB	2-3	0.9
1979			81.2	1.6				
24								
1977		6.1	80.0	1.3	1.4	DEC-FEB	2-3	
25								
1977	76.3	1.9	83.5	1.8	1.4	SEP-OCT	2-3	
1978	25.6	8.7	85.3	1.6	1.8	SEP-OCT	2-3	7.1
1979	24.1	13.5	87.5	1.9				
26								
1977	83.1	4.3	90.2	2.3	1.6	JAN-FEB	2-3	
1979	74.2	6.7	85.0	1.8				
27								
1978		1.2	96.6	1.2		DEC-JAN	2-3	
1979			79.3	1.4				
28								
1979			85.6	2.0		OCT-NOV	2-3	
29								
1979			86.3			OCT-NOV	2-3	
30								
1979			92.6	1.7		DEC-JAN	2-3	
31								
1979			86.3	3.0		DEC-JAN	3	

Table 4 Performance of 1977, 1978, and 1979 year Classes of Rainbow Trout Strains in Standard Environment at Fish Genetics Laboratory (Non-Growth Traits). (Continued)

Strain[a] and Year class	Hatch (%)	Deformed fry (%)	Fingerling survival (%)	Feed conversion		Spawning period	Maturity (years)	Precocious males (%)
				84-147 days	148-364 days			
32								
1978	71.1	6.4	80.7	1.5		SEP-OCT	2	
33								
1977	81.6	3.8	92.3	1.4	1.4	SEP-OCT	2	
1979	52.8	3.6	84.3	1.4	1.7			
34								
1977	76.2	11.6	81.4	1.5	1.5	JAN-FEB	2	
1979	75.2	9.1		1.5				

[a] Description of each strain by strain identification number is given in Table 3.

Table 5 Average weight (grams) of 1977, 1978, and 1979 Year Classes of Rainbow Trout Strains reared in Standard Environmental at Fish Genetics Laboratory (Growth Traits).

Strain[a] and Year Class	Average weight (g) at ages (days)							Days required to reach specific hatchery sizes	
	147	189	245	301	364	728-Males	728-Females	50 Fish per lb.	Total length of 8 in.
10									
1977	3.6	11.1	29.3	58.2	110.0	632	568	180	347
1978	2.8	6.6	18.5	36.0	64.9			204	410
1979	3.7	11.0	29.3	43.2				150	437
11									
1977	5.5	18.3	45.5	95.7	199.9	915	990	162	299
1978	5.6	14.4	32.3	67.3	126.7	582	586	157	333
1979	6.2	18.2	47.0	96.0	181.0			150	299
12									
1977	5.5	16.7	37.0	73.9	194.1	1015	1124	164	315
1979	5.4	15.1	39.6	96.5	169.2			167	299
13									
1977	2.5	8.3	21.5	51.3	99.1	805	595	194	358
1978	2.4	6.1	24.0	46.9	62.0			203	468
1979	2.7	8.3		44.0				193	377
14									
1977	3.1	10.8	29.3	59.8	112.5	674	578	182	345
1978	3.0	8.7	31.2	48.3	86.1			191	375
1979	3.6	12.4	32.4	64.8				177	337
15									
1977	5.7	17.8	38.9	83.7	172.7	833	866	162	310
1978	4.5	11.4	25.6	49.3	101.7	496	490	178	356
1979	6.1	16.6	39.0	81.6	167.9			162	312

Table 5 Average weight (grams) of 1977, 1978, and 1979 Year Classes of Rainbow Trout Strains reared in Standard Environmental at Fish Genetics Laboratory (Growth Traits). (Continued)

Strain[a/] and Year Class	Average weight (g) at ages (days)							Days required to reach specific hatchery sizes	
	147	189	245	301	364	728-Males	728-Females	50 Fish per lb.	Total length of 8 in.
16									
1977	3.7	13.7	36.3	74.6	143.9	682	618	175	322
1978	3.0	10.6	31.7	58.7	111.9			183	346
1979	4.3	14.2	33.9	76.0				171	374
17									
1978	4.8	14.0	32.7	65.2	122.8	601	689	170	336
1979	7.1	21.6	45.3	97.5	185.0			155	298
18									
1977	2.9	8.7	25.6	47.4	86.9	462	483	149	373
1978	2.6	5.3	17.4	37.2	63.9			212	416
1979	3.0	8.7		39.2				191	397
19									
1978	3.0	10.2	18.4	31.1	53.4			184	443
1979	3.7			41.4				190	
20									
1978	3.0	7.9	19.9	40.1	68.5			196	407
1979	3.3	10.4	28.0	55.6				183	353
21									
1977	5.2	16.9	40.1	87.4	181.6	878	869	156	307
1979	6.3	19.0	55.9	100.8	188.0			159	286
22									
1977	6.3	18.9	45.0	96.4	176.4	924	912	159	299
1979	6.1	18.3	50.2					160	291

Table 5 Average weight (grams) of 1977, 1978, and 1979 Year Classes of Rainbow Trout Strains reared in Standard Environmental at Fish Genetics Laboratory (Growth Traits). (Continued)

Strain[a/] and Year Class	Average weight (g) at ages (days)							Days required to reach specific hatchery sizes	
	147	189	245	301	364	728-Males	728-Females	50 Fish per lb.	Total length of 8 in.
23									
1977	4.6	15.9	43.2	79.9	146.6	643	560	168	316
1979	5.6	15.6	46.4	73.8				165	390
24									
1977	7.8	23.0	68.5	118.5	217.3	943	868	152	276
25									
1977	5.8	17.9	36.0	79.9	173.7	971	935	162	313
1978	4.5	12.3	28.6	53.1	104.0	620	659	174	354
1979	6.1	16.4	34.3	81.3	160.8			163	313
26									
1977	3.4	11.1	32.3	60.0	102.6			181	353
1979	3.7	11.1	47.9	113.1				180	335
27									
1978	2.7	8.4	27.3	61.0	104.6			192	351
28									
1979	7.1								
30									
1979	4.1	12.8						175	
31									
1979	2.5								

Table 5 Average weight (grams) of 1977, 1978, and 1979 Year Classes of Rainbow Trout Strains reared in Standard Environmental at Fish Genetics Laboratory (Growth Traits). (Continued)

Strain[a] and Year Class	Average weight (g) at ages (days)							Days required to reach specific hatchery sizes	
	147	189	245	301	364	728-Males	728-Females	50 Fish per lb.	Total length of 8 in.
32									
1978	5.9	17.1	40.7	73.5	178.5	700	701	163	317
33									
1977	7.3	21.8	52.4	101.1	211.2	1084	1085	154	294
1979	10.7	26.9	61.1	114.3	220.3			141	282
34									
1977	5.9	15.8	42.7	85.0	152.4	856	819	164	311
1979	6.3	18.8						159	

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[a] Description of each strain by strain identification numbers is given in Table 3.

Table 6 Summary of morphology traits evaluated for 11 strains of rainbow trout at the Fish Genetics Laboratory. Means and standard deviations (in parentheses) are given for each strain. Data are adjusted for year-to-year variation.

Spawning season, strain[a/] and strain type, D=domestic; N=natural		Number of fin rays				Number of vertebral	Fish with vertebral fusions (%)
		Dorsal	Pectoral	Anal	Pelvic		
Fall							
11	D	15.44 (0.33)	13.77 (0.32)	11.44 (0.21)	13.81 (0.54)	62.27 (0.99)	17.3
12	D	15.82 (0.46)	14.08 (0.48)	11.60 (0.32)	13.58 (0.64)	62.33 (0.84)	27.2
15	D	15.49 (0.45)	14.12 (0.39)	11.82 (0.15)	14.19 (0.48)	61.56 (1.20)	7.4
17	D	16.09 (1.02)	14.38 (0.83)	11.84 (0.60)	14.70 (1.42)	62.05 (1.10)	13.4
Winter							
10	N	14.70 (0.45)	13.37 (0.63)	10.97 (0.39)	12.78 (0.47)	61.68 (0.77)	6.2
13	N	15.82 (1.02)	14.07 (1.58)	11.83 (1.46)	14.33 (1.09)	61.03 (2.03)	2.7
16	D	15.34 (0.48)	14.50 (0.51)	11.80 (0.29)	14.62 (0.62)	61.49 (0.78)	7.7
18	N	15.42 (1.14)	13.85 (1.11)	11.68 (1.02)	14.04 (1.12)	61.39 (1.04)	7.5

Table 6 Summary of morphology traits evaluated for 11 strains of rainbow trout at the Fish Genetics Laboratory. Means and standard deviations (in parentheses) are given for each strain. Data are adjusted for year-to-year variation. (Continued)

Spawning season, strain[a/] and strain type, D=domestic; N=natural		Number of fin rays				Number of vertebral	Fish with vertebral fusions (%)
		Dorsal	Pectoral	Anal	Pelvic		
Winter							
20	N	15.18 (1.54)	13.66 (1.25)	10.92 (1.87)	13.49 (2.04)	61.58 (1.26)	13.1
26	D	15.50	14.34 (1.07)	11.18 (1.41)	14.60 (1.52)	61.68 (1.10)	7.1 (0.98)
27	D	15.07 (1.06)	14.63 (1.30)	11.67 (1.54)	14.09 (1.14)	61.99 (0.82)	3.7

[a/] Description of each strain by strain identification number is given in Table 3.

Table 7 Evaluation of 9 strains of rainbow trout released in a 1-hectare pond at Fish Genetics Laboratory in 1977-78. Average weight gained and percent of fish recovered during three recovery periods conducted at 6-month intervals after planting. All fish were reared in the standard environment at the laboratory until they were stocked as finglerings (age, about 7 months).

		Recovery periods[b]								
		6 months			12 months		18 months		Total	
Year class and strain[a]	Average weight (g) at planting	weight (g)	return (%)	angling[c] (%)	weight (g)	return (%)	weight (g)	return (%)	biomass[d] (g)	return (%)
Fall Spawning, Spring Stocking										
1977										
11	13.8	98.0	13.5	63.2	149.0	5.0		0.0	2,068	18.5
12	13.0	85.1	11.5	68.8	182.0	5.9	295.0	2.9	2,890	20.3
15	13.8	90.5	8.2	56.9	162.3	4.0	310.7	0.4	1,516	12.6
1978										
11	22.5	82.8	10.0	77.8	259.3	7.8	Study terminated at 12 months		2,851	17.8
15	17.0	75.9	9.7	67.4	170.7	10.2			2,477	19.9
17	19.7	83.4	10.8	63.4	177.8	11.3			3,744	32.1
Winter Spawning, Fall Stocking										
1977										
10	24.4	97.2	20.3	75.0	129.0	5.1	237.0	3.4	3,437	28.8
13	21.4	69.0	18.8	100.0	190.0	6.3		0.0	2,494	25.1
14	31.8	82.0	18.8	83.3		0.0	208.0	3.1	2,186	21.9
16	31.5	85.3	38.0	94.6	185.2	6.1	446.3	0.6	4,639	44.7
18	21.9	67.7	11.5	62.5	175.1	4.1	230.9	3.5	2,305	19.1

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[a] Individual strains are described in Table 3.

[b] Recovery periods were conducted at 6-month intervals after initial stocking. Each recovery period consisted of 2-weeks of public angling (controlled to obtain about 1000 angler hours of fishing pressure) and 5-days of gillnetting (about 100 hours). Fish taken during each recovery operation were individually identified by strain and weighed. Fish were not returned to the pond. Fishing was not allowed between recovery periods. Additional fingerlings were stocked after each recovery period to maintain uniform population densities and structures during each 6-month interval.

[c] Angling percent is calculated as the percent of fish returning to anglers as compared to the total return during the first recovery period.

[d] Biomass is the total weight of fish recovered per 100 fish stocked of each strain. Biomass is calculated as mean weight times return at 6-months plus mean weight times return at 12-months plus mean weight times return at 18-months; biomass is independent of number of fish stocked and allows direct comparison of strains stocked concurrently.

Table 8 Gene frequencies measured in 15 rainbow trout strains by starch gel electrophoresis. Only isozyme systems that expressed genetic variability are included here.

Loci[b]	Allele	Tissue[c]	Strain of rainbow trout[a]							
			10	13	14	15	16	18	19	20
G3pdh-1	100	M	.99	.86	.93	.92	.90	.90	1.00	.99
	10		.01	.14	.07	.08	.10	.10	.00	.01
Gpi-2	100	M	1.00	1.00	1.00	.92	1.00	1.00	1.00	1.00
	133		.00	.00	.00	.08	.00	.00	.00	.00
Idh-2	100	M	.70	.89		.72	.77	.49		
	140		.30	.11		.28	.23	.51		
Idh-3,4	100	L	.76	.41	.66	.91	.60	.62	.83	.68
	110		.00	.00	.00	.00	.00	.00	.00	.00
	120		.03	.00	.08	.01	.12	.07	.00	.09
	130		.00	.00	.00	.00	.00	.00	.00	.00
	150		.00	.00	.00	.00	.01	.04	.00	.00
	85		.00	.00	.00	.00	.00	.00	.00	.00
	71		.03	.32	.08	.06	.08	.03	.02	.03
	40		.18	.27	.19	.02	.19	.23	.15	.20
Ldh-4	100	L	.96	1.00	.99	1.00	.81	1.00	.99	1.00
	76		.04	.00	.01	.00	.19	.00	.01	.00
Idh-5	100	E		.77	1.00		1.00	1.00	.99	1.00
	98			.23	.00		.00	.00	.01	.00
Mdh-3,4	100	M	.86	.87	.94	1.00	.89	.85	.99	.91
	120		.03	.00	.00	.00	.00	.00	.00	.00
	91		.00	.00	.01	.00	.00	.00	.00	.00
	83		.11	.00	.05	.00	.04	.14	.01	.00
	75		.00	.13	.00	.00	.07	.01	.00	.00
	40		.00	.00	.00	.00	.00	.00	.00	.09

Table 8 Gene frequencies measured in 15 rainbow trout strains by starch gel electrophoresis. Only isozyme systems that expressed genetic variability are included here. (Continued)

Loci[b]	Allele	Tissue[c]	Strain of rainbow trout[a]							
			10	13	14	15	16	18	19	20
Me-1,2	100	M	1.00	1.00		1.00	1.00	1.00		
	20		.00	.00		.00	.00	.00		
Me-4	100	L	.94	1.00	1.00	1.00	1.00	1.00	.81	1.00
	82		.06	.00	.00	.00	.00	.00	.19	.00
Pgm-1	100	M	1.00	.39			1.00	1.00		
	0		.00	.61			.00	.00		
Pgm-2	100	M	.89	.09	.95	.91	.81	.92	.99	.98
	85		.11	.91	.05	.09	.19	.08	.01	.02
Sdh-1,2	100	L	1.00	1.00		1.00	1.00	.97		
	195		.00	.00		.00	.00	.03		
Sod-1	100	L	.87	.79	.91	.28	.90	.95	.53	.61
	152		.13	.21	.09	.72	.10	.05	.47	.38
	38		.00	.00	.00	.00	.00	.00	.00	.01

Table 8 Gene frequencies measured in 15 rainbow trout strains by starch gel electrophoresis. Only isozyme systems that expressed genetic variability are included here. (Continued)

Loci[b/]	Allele	Tissue[c/]	Strain of rainbow trout[a/]						
			21	22	23	26	27	33	34
G3pdh-1	100	M	.99	1.00	1.00	.89	.87	.86	1.00
	10		.01	.00	.00	.11	.13	.14	.00
Gpi-2	100	M	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	133		.00	.00	.00	.00	.00	.00	.00
Idh-2	100	M	.50	.60	.51	.71			.76
	140		.50	.40	.49	.29			.24
Idh-3,4	100	L	.64	.50	.56	.53	.83		.37
	110		.00	.00	.00	.00	.00		.06
	120		.00	.20	.16	.15	.00		.37
	130		.00	.00	.00	.00	.00		.02
	150		.00	.00	.00	.00	.00		.00
	85		.00	.00	.00	.00	.00		.01
	71		.13	.13	.17	.11	.09		.04
	40		.23	.17	.11	.21	.08		.12
Ldh-4	100	L	.99	1.00	1.00	1.00	1.00	1.00	.95
	76		.01	.00	.00	.00	.00	.00	.05
Ldh-5	100	E	1.00	1.00	1.00	.94	1.00		
	98			.00	.00	.06	.00		
Mdh-3,4	100	M	.77	.91	.83	.95	.92	1.00	.89
	120		.00	.03	.08	.00	.00	.00	.00
	91		.00	.00	.00	.00	.01	.00	.00
	83		.23	.06	.09	.05	.07	.00	.11
	75		.00	.00	.00	.00	.00	.00	.00
	40		.00	.00	.00	.00	.00	.00	.00

Table 8 Gene frequencies measured in 15 rainbow trout strains by starch gel electrophoresis. Only isozyme systems that expressed genetic variability are included here. (Continued)

Loci[b]	Allele	Tissue[c]	Strain of rainbow trout[a]						
			21	22	23	26	27	33	34
Me-1,2	100	M	1.00	.91	.98	1.00		1.00	1.00
	20		.00	.01	.02	.00		.00	.00
Me-4	100	L	1.00	1.00	1.00	1.00	1.00		1.00
	82		.00	.00	.00	.00	.00		.00
Pgm-1	100	M	1.00	1.00	1.00	1.00		1.00	1.00
	0		.00	.00	.00	.00		.00	.00
Pgm-2	100	M	.89	1.00	.76	.72	.80	.94	1.00
	85		.11	.00	.24	.28	.20	.06	.00
Sdh-1,2	100	L	1.00	1.00	1.00	1.00		1.00	1.00
	195		.00	.00	.00	.00		.00	.00
Sod-1	100	L	.59	.94	.94	.96	.74	.53	.76
	152		.41	.06	.06	.04	.21	.47	.24
	38		.00	.00	.00	.00	.05	.00	.00

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[a] Description of each strain by strain identification number is given in table 3.

[b] Loci are named for the protein products produced. Abbreviations for the protein systems: G3pdh=glycerol-3-phosphate dehydrogenase; Gpi=glucose-phosphate isomerase; Idh=isocitrate dehydrogenase; Ldh=lactate dehydrogenase; Mdh=malate dehydrogenase; Me=Malic enzyme; Pgm=phosphoglucomutase; Sdh=sorbitol dehydrogenase; and Sod=superoxide dismutase. Number following protein system abbreviation identifies the specific locus. Two numbers following protein system abbreviation indicates duplicate loci that can not be separated.

[c] Body tissues used to determine gene frequencies for each locus. Abbreviations for tissues: E=eye; M=muscle; and L=liver.

Table 9 Average weight (grams), feed conversion rate, and fish survival (percent) of rainbow trout strains evaluated in National Fish System from 1975 to 1979.

		Time in days after fertilization											
		147				245				364			
Strain[a] and Year Class	National Fish Hatchery[b]	Mean weight	Feed conversion	Survival (%)	Growth rate (in/mo)	Mean weight	Feed conversion	Survival (%)	Growth rate (in/mo)	Mean weight	Feed conversion	Survival (%)	Growth rate (in/mo)
10													
1976	FCDC	5.11	1.54	97.6	0.62	24.9	1.32	96.5	0.64	56.5	1.66	96.0	0.51
1977	FCDC	5.75	1.73	86.6	0.65	15.5	2.46	81.7	0.52	60.7	1.83	81.0	0.49
1978	FCDC	3.60	1.34	99.5	0.58	15.2	1.84	98.4	0.50	46.7	1.83	97.8	0.50
1979	FCDC	5.20	1.42	99.3	0.13	13.1	1.62	98.7	0.34	41.9	1.92	97.2	0.50
12													
1976	FCDC	7.05	1.12		0.91	32.4	1.32		0.75				
13													
1974	FCDC	1.58	2.21	98.3	0.55	6.8	2.64	98.3	0.44				
14													
1974	FCDC	1.93	2.04	98.1	0.58	10.4	1.91	98.1	0.55				
1975	FCDC	3.25	1.98		0.48	12.0	1.93		0.45	39.8	1.89		0.48
15													
1975	FCDC	4.16	1.57		0.67	17.6	1.71		0.56				
1976	FCDC	6.76	1.37		0.78	28.1	1.55		0.67				
1977	FCDC	4.77	1.56	99.3	0.64	23.5	1.33	99.1	0.66				
1977	FCDC	5.50	1.21	99.4	0.74	28.0	1.21	99.2	0.72				
1978	FCDC	5.62	1.29	96.6	0.80	19.5	1.77	86.3	0.62				
1979	FCDC	2.30	2.28	99.8		15.6	1.75	98.7	0.66				
1979	Walhalla	0.60			0.20	9.9			0.71	54.0			0.73

Table 9 Average weight (grams), feed conversion rate, and fish survival (percent) of rainbow trout strains evaluated in National Fish System from 1975 to 1979. (Continued)

		Time in days after fertilization											
		147				245				364			
Strain[a/] and Year Class	National Fish Hatchery[b/]	Mean weight	Feed conversion	Survival (%)	Growth rate (in/mo)	Mean weight	Feed conversion	Survival (%)	Growth rate (in/mo)	Mean weight	Feed conversion	Survival (%)	Growth rate (in/mo)
16													
1975	FCDC	3.53	1.93		0.49	14.1	1.82		0.50	50.4	1.67		0.53
1976	FCDC	6.09	1.29	95.4	0.74	32.4	1.10	90.5	0.75	91.8	1.40	87.1	0.65
1976	FCDC	5.55	1.30	95.8	0.72	27.2	1.29	85.1	0.69	74.9	1.53	84.6	0.60
1977	FCDC	7.25	1.40	84.2	0.76	26.2	1.58	78.5	0.67	95.4	1.47	77.5	0.68
1978	FCDC	2.50	1.12	99.3	0.55	15.0	1.31	98.3	0.60	63.8	1.35	97.9	0.67
1979	FCDC	4.40	1.47	99.7	0.12	12.5	1.52	98.6	0.36	41.4	1.82	98.3	0.51
1979	McNenny	4.10	1.28	96.6	0.63	21.3	1.35	92.5	0.63				
17													
1976	FCDC	8.00	1.16		0.83	37.5	1.26		0.76				
1978	FCDC	5.18	1.28	91.7	0.83	22.6	1.42		0.69				
1979	FCDC	2.40	1.54	99.7		15.4	1.44	90.2	0.62				
1979	Walhalla	1.10			0.22	12.0		99.3	0.68	71.8			0.83
18													
1978	FCDC	3.91	1.76	78.2	0.60	13.2	2.44	73.8	0.48	46.4	1.71	72.7	0.53
1978	FCDC	2.30	1.84	99.2	0.26	9.3	2.03	96.7	0.48	26.0	2.29	91.0	0.29
1979	FCDC	1.40	1.18	94.2	0.54	9.0	1.76	87.8	0.50				
20													
1978	FCDC	3.10	1.54	97.8	0.58	14.5	1.71	96.4	0.51	32.9	2.38	94.3	0.34

Table 9 Average weight (grams), feed conversion rate, and fish survival (percent) of rainbow trout strains evaluated in National Fish System from 1975 to 1979. (Continued)

		Time in days after fertilization											
		147				245				364			
Strain[a/] and Year Class	National Fish Hatchery[b/]	Mean weight	Feed conversion	Survival (%)	Growth rate (in/mo)	Mean weight	Feed conversion	Survival (%)	Growth rate (in/mo)	Mean weight	Feed conversion	Survival (%)	Growth rate (in/mo)
22													
1975	FCDC	5.04	1.44		0.59	23.9	1.40		0.61	82.7	1.40		0.63
1977	FCDC	6.74	1.13	96.3	1.03	31.0	1.58	86.2	0.78	100.3	1.44	83.6	0.75
1978	FCDC	2.20	1.66	99.5	0.53	15.7	1.61	98.2	0.43	67.3	1.43	97.7	0.69
1979	FCDC	5.10	1.25	99.9	0.11	13.6	1.65	99.5	0.36	63.3	1.39	99.4	0.71
1979	McNenny	5.00		84.7	0.68	25.9	1.09	84.0	0.67	92.0	1.19	81.1	0.69
1979	Walhalla	1.30			0.33	27.1			1.04				
23													
1979	McNenny	4.80	1.02	98.3	0.71	23.9	1.16	97.6	0.64	79.6	1.29	90.9	0.63
25													
1979	FCDC	2.20	1.05	99.8		13.7	1.56	99.6	0.59				
26													
1974	FCDC	2.26	2.00	97.8	0.58	11.5	1.84	97.8	0.55				
28													
1979	Walhalla	0.71			0.24	7.8			0.59				
1979	FCDC					15.4			0.62				
30													
1979	FCDC	3.41	1.65	96.9	0.62	17.0	1.52	96.6	0.57	63.7	1.52	92.1	0.63
1979	Walhalla	2.90			0.47				0.58				

Table 9 Average weight (grams), feed conversion rate, and fish survival (percent) of rainbow trout strains evaluated in National Fish System from 1975 to 1979. (Continued)

		Time in days after fertilization											
		147				245				364			
Strain[a/] and Year Class	National Fish Hatchery[b/]	Mean weight	Feed conversion	Survival (%)	Growth rate (in/mo)	Mean weight	Feed conversion	Survival (%)	Growth rate (in/mo)	Mean weight	Feed conversion	Survival (%)	Growth rate (in/mo)
33													
1975	FCDC	5.04	1.42		0.75	22.7	1.92		0.63				
34													
1974	FCDC	3.15	1.62	98.9	0.67	18.4	1.50	98.8	0.66				
1975	FCDC	4.63	1.49		0.60	20.3	1.47		0.59	71.0	1.48		0.60
1976	FCDC	7.33	1.16	96.3	0.79	41.0	1.02	95.0	0.81	115.5	1.28	93.1	0.70

[a/] Description of each strain by strain identification number is given in Table 1.

[b/] Location of National Fish Hatchery Facilities conducting production test. FCDC=Fish Cultural Development Center, Bozeman, Montana.

Table 10 Brown trout strains being maintained in U.S. Fish and Wildlife Service National Hatchery System August 1981.

Strain	Hatchery	Disease Classification[a]	Spawning Period
Nashua	Lamar, PA	B-VP-BF-(BK)	November
Nashua	North Attleboro, MA	A-2	November-December
Nashua	Paint Bank, VA	A-2(BF)	November-December
Plymouth Rock	Crawford, NE	A-1	November-December
Plymouth Rock	Norfork, AR	B-BK-(VP)	November-December
Plymouth Rock	Paint Bank, VA	A-2(BF)	November-December
Walhalla	Walhalla, SC	B-BF-VP-SBK	November
West Virginia	Bowden, WV	B-BF-VP-BK	October

[a] Disease Classification: A-1=hatchery has a closed water supply that is free of fish and has been free of certifiable disease for a period of two years; A-2=hatchery has an open water supply or a closed water supply harboring fish and a two year history of being free of certifiable diseases; B=hatchery that has had one or more of the certifiable diseases within the past two years; BF=furunculosis; BK=bacterial kidney disease; BR=enteric redmouth; SC=*Ceratomyxa shasta*; VP=infectious pancreatic necrosis; VH=viral hemorrhagic septicemia; SBK=suspected bacterial kidney disease. Disease symbols include within a parenthetical are suspected of being diseased.

Table 11 Brown trout brood stock maintained by State Fish and Game Departments in 1980[a]. (Abbreviations: brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses).

State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
California						
WHITNEY BROWN	Oct-Nov	5000	D	Brood stock obtained from wild fish taken from Walker Drainage. Fish are believed to have been derived from the Massachusetts strain.	PTS,PTL	
SHASTA BROWN	Oct-Nov	4000	D	Obtained as an egg shipment from Mt. Lassen Trout Farm (commercial source) in 1972. Brood stock believed to have been derived from the Massachusetts strain.	PTS,PTL, FS,FL	
Colorado						
DILLON Dillon Reservior Colorado	Oct	3000+	N	Wild fish with supplemental stocking as recently as 1979.	FS,FL	

Table 11 Brown trout brood stock maintained by State Fish and Game Departments in 1980[a]. (Abbreviations: brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Colorado Continued						
DELANEY BUTTES North Delaney Butte, Lake	Oct	3000+	N	Multiple introductions from different sources. Supplemental stocking as recently as 1979.	FS,FL	
Connecticut						
CORTLAND Quinebaug SFH		500	D	Single introduction of domestic fish in 1976.		
BITTERROOT Quinebaug SFH		140	D	Single introduction of domestic fish from Harriman Trout Company, Montanta, in 1979.		Good stream survival.
ROME STRAIN Burlington SFH		250	D	Two introductions of domestic fish from Rome, New York in late 1960's.	PTS,PTL	Furunculosis resistance.
SAM BROWN Quinebaug SFH		500	D	Single introduction of domestic fish in 1975.		

Table 11 Brown trout brood stock maintained by State Fish and Game Departments in 1980[a]. (Abbreviations: brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Indiana						
6-RNY-BNT Curtis Creek Trout Rearing Station, Howe	late Oct-mid Nov	250	D	Single introduction of wild fish from eggs stripped from Lake Superior brown trout in 1976.	PTS,PTL	New York's Randolph State Fish Hatchery supplied Indiana with 200,000 eyed brown trout eggs in 1976. These eggs were stripped from Lake Superior brown trout.
Iowa						
NO NAME Manchester Trout Hatchery	Oct-Nov	250	D	Single introduction of domestic fish from U.S. Fish and Wildlife Service in 1968.	PTS,FS	Growth .016 inch/ day at 50° F, susceptible to *Aeromenas*, seem to adapt readily to stream conditions.

Table 11 Brown trout brood stock maintained by State Fish and Game Departments in 1980[a/]. (Abbreviations: brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b/] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Maine						
NEW GLOUCESTER New Gloucester SFH, Gray		1000	D	Developed from survivors of a variety of domestic stockings (Cortland, New York; Plymouth Rock, Massachusetts; Carolina; Rhode Island) in natural ponds in Maine. Hatchery brood stock is supplemented every 3 years with egg collections from the wild populations.	FS,FL	
CONNECTICUT Deblois SFH, Cherryfield		500	D	Single introduction of domestic fish from Quinebaug, Connecticut SFH in 1977.	FS,FL	This is a Cortland (New York) mixture.

Table 11 Brown trout brood stock maintained by State Fish and Game Departments in 1980[a]. (Abbreviations: brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Massachusetts						
SANDWICH BROWN Sandwich Fish Hatchery		500	D	Single introduction of domestic fish from Sudnerland SFH, Sunderland, Massachusetts between 1951 and 1955.	PTL	Fish grow fast and produce moderate returns in low fertility ponds and lakes, especially if forage is present.
SANDWICH SEA TROUT East Sandwich Fish Hatchery		100	M	Multiple introductions from different sources; wild, Sandwich Hatchery, and others.	OS	Fish migrate to sea, feed and grow well, then return to stream of release.
Michigan						
MICHIGAN BROWNS Oden SFH		1000	D	Unknown	FS, FL, OS	Progeny do well in hatchery and provide good growth and good returns in lakes and streams.

Table 11 Brown trout brood stock maintained by State Fish and Game Departments in 1980[a]. (Abbreviations: brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Minnesota						
CRAWFORD Lanesboro SFH Hatchery			D	Single introduction of domestic fish from Crawford (Nebraska) NFH in 1980.	PTS, PTL, FS, FL OS	
Missouri						
FLAMING FORGE Shepherd of the Hills Hatchery,	Nov	1000	D	Multiple introductions from Egan SFH Bicknell, Utah in 1976 and 1977.	PTS, PTL	Free of all certifiable disease except bacterial kidney disease. Good looking fish-color and conformation.
New Jersey						
HACKETTSTOWN BROWNS Hackettstown SFH	Sep 15-Oct 25	3000	D	Multiple introductions from different sources.	PTS, PTL	Brood stock was selectively bred for spawning in late September; several recurrent diseases occur.

Table 11 Brown trout brood stock maintained by State Fish and Game Departments in 1980[a]. (Abbreviations: brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
New York						
CATSKILL Catskill Fish Hatchery, DeBruce	Sep 1-Oct 15	1000	D	Single introduction of domestic fish from Randolph Hatchery in 1949.	PTS,PTL, FS,FL, OS	
ROME LAB Fish Disease Control Unit, Rome		3000	D	Multiple introductions from different sources.	PTS,PTL, FS,FL, OS	Bred for furunculosis resistance.
North Carolina						
1BA8 Armstrong SFH, Marion	Oct 15-Nov 15	1000	D	Single introduction of domestic fish from production lot 7BA6 in 1978.	PTS,PTL, FS,FL	
2BA(LC)6, Armstrong SFH, Marion	Oct 15-Nov 15	250	M	Wild fish with supplemental stocking in the early 1960's.	FS,OS	Parent females were domestic fish.

Table 11 Brown trout brood stock maintained by State Fish and Game Departments in 1980[a/]. (Abbreviations: brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b/] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
North Carolina Continued						
6BA7 Armstrong SFH, Marion	Oct 15-Nov 15	500	D	Single introduction of domestic fish from brood lot 1BA5 in 1978.	PTS,PTL, FS,FL	
1B(AC)6 Armstrong SFH, Marion	Oct 15-Nov 15	100	N	Wild fish with no supplemental stocking.	FS,FL	These fish are used to cross with domestic fish for special stocking as fingerlings.
Ohio						
NASHUA London Fish Hatchery		200	D	Single introduction of domestic fish as eyed eggs from Quinebaug SFH, Connecticut.	FS	Brood stock has some inbreeding problems (not specified).
Oregon						
SUTTLE LAKE		Whatever can be trapped	N	Wild fish with no known supplemental stocking.	FL	

Table 11 Brown trout brood stock maintained by State Fish and Game Departments in 1980[a/]. (Abbreviations: brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b/] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Pennsylvania						
REYNOLDSDALE Reynoldsdale and Big Spring SFH	mid Sep-mid Oct	3000	D	Single introduction of domestic fish from Traxler Hatchery, Allentown, Pennsylvania in the 1930's.	PTS,FS	Apparently free from bacterial kidney disease; not as resistant to infectious pancreatic necrosis as Bellefonte Open Strain.
BELLEFONTE OPEN Spring Creek and Oswayo SFH necrosis.	mid Sep-mid Oct	3000	D	Single introduction of domestic fish from Traxler's Hatchery Allentown, Pennsylvania prior to 1940.	PTS,PTL	Good performance in hatchery and high resistance to infectious pancreatic
HUNTSDALE Huntsdale and Big Spring SFH	mid Sep-mid Oct	3000+	D	Multiple introductions from different sources (main source was Reynoldsdale hatchery in 1946).	PTS,PTL	Poor egg hatchability.

Table 11 Brown trout brood stock maintained by State Fish and Game Departments in 1980[a/]. (Abbreviations: brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b/] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Rhode Island						
NO NAME Lafayette State Trout Hatchery		250	D	Multiple introductions from the North Attleboro, Massachusetts NFH.	PTS,PTL	
South Dakota						
WYO 201-76 Cleghorn Springs Trout Hatchery, Rapid City		100	D	Single introduction of domestic fish from Daniel (Wyoming) SFH in January 1976.		Good feed conversion. Some problem with tail and and fin rot.
MT. SHASTA, 201-77 Cleghorn Springs Trout Hatchery, Rapid City	Fall	100	D	Single introduction of domestic fish from Mt. Shasta Hatchery (California) SFH in January 1977.	PTS	Parent stock accepted dry feed, with excellent results. Hatch about average and survival of fry good.
Utah						
SHEEP CREEK GBT Egan Hatchery, Bicknell	mid Oct-mid Dec	1000	D	Single introduction of wild fish from Flaming Gorge Reservoir, Utah, in 1973.	PTS,FL	Good looking fish. Seem to be quite hardy and vigorous. Produce good percent of eyed eggs and fry.

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State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Vermont						
BENNINGTON Vermont State Fish Hatchery, Bennington	mid Oct	500	D	Single introduction of domestic fish from Rome Fisheries Laboratory, Rome, New York in 1965.	PTS,PTL, FS	Furunculosis resistant strain.
Virginia						
NO NAME Marion SFH	Oct	1200	D	Unknown	FS,FL	During 1979-1980 season 667,000 eggs were produced.
West Virginia						
WEST VIRGINIA BROWN Edray Trout Hatchery, Marlington		3000	D	Single introduction of domestic fish from Leetown National Fish Hatchery in 1958.	PTS,FS	Growth good, average to low angling susceptibility, furunculosis resistant.

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State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Wisconsin						
WILD ROSE Wildrose SFH	late Sep-Oct	1000	D	During late 1950's, original wild rose strain was crossed to a domestic strain introduced from Cortland, New York, in 1954. The wild rose strain has been introduced into the hatchery several times in the past.	PTS,PTL, FS,FL	Resistant to handling stress. Three-year-old females produce 3000+ eggs. Resistant to furunculosis.
NO NAME St. Croix Falls SFH	Oct	600	D	Brood stock developed from a cross between the wild rose brood stock and the Nashua strain in 1979 and 1980. The Nashua strain was obtained from the Nashua NFH during the mid 1970's.	PTS,PTL, FS,FL	Brood stock is being selected for body conformation, body markings, and growth under a family selection program.

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State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Wyoming						
NO NAME Soda Lake, Pinedale		3000+	D	Multiple introduction of domestic fish from Big Sandy Reservoir.	PTS, FS, FL	

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[a] Brood stock information taken from questionaires completed by State Fish and Game Departments during 1980. States reporting brown trout brood stocks are listed in the body of this table.

[b] Locality (city) shown separately when it is not included in the name of the hatchery.

Table 12 Brook trout strains being maintained in U.S. Fish and Wildlife Service National Hatchery System August 1981.

Strain	Hatchery	Disease Classification[a/]	Spawning Period
Nashua	North Attleboro, MA	A-2	November-December
Owhi	Crawford, NE	A-1	December-January
Owhi	Paint Bank, VA	A-2(BF)	November-December
Owhi	White Sulphur Springs, WV	A-1	December-January
Owhi	Winthrop, WA	B-BK-(BF-SC-BR)	December
Pisgah Forest	Pisgah Forest, NC	B-BF-BR-VP-SBK	October-November
Rome	Walhalla, SC	B-BF-VP-SBK	December
West Virginia	Bowden, WV	B-BF-VP-BK	October

[a/] Disease Classification: A-1=hatchery has a closed water supply that is free of fish and has been free of certifiable disease for a period of two years; A-2=hatchery has an open water supply or a closed water supply harboring fish and a two year history of being free of certifiable diseases; B=hatchery that has had one or more of the certifiable diseases within the past two years; BF=furunculosis; BK=bacterial kidney disease; BR=enteric redmouth; SC=*Ceratomyxa shasta*; VP=infectious pancreatic necrosis; VH=viral hemorrhagic septicemia; SBK=suspected bacterial kidney disease. Disease symbols include within a parenthetical are suspected of being diseased.

Table 13 Brook trout brood stock maintained by State Fish and Game Departments in 1980[a]. (Abbreviations: brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses).

State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
California						
WHITNEY BROOK	Nov-Dec	5000	D	Derived from wild fish taken from Little Walker Lake during 1930's. The brook trout was presumably introduced into California in the 1920's, but the source is unknown.	PTS,FS	
SAN JOAQUIN BROOK	Nov-Dec	2000	D	Obtained from West Virginia in 1975.	PTS,PTL FS,FL	Brood stock has been maintained since introduction without treatment for natural outbreaks of furunculosis as a means for improving resistance to this disease.
Colorado						
ELECTRA LAKE Electra lake Colorado	Oct	3000+	N	Multiple introductions from different sources, restocked annually.	FL,OS	

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State[b/] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Connecticut						
NASHUA Quinebaug SFH		1000	D	Single introduction of domestic fish from Nashua NFH in 1971.	PTS,PTL	
WHITE SULPHUR Quinebaug SFH		1000	D	Single introduction of domestic fish from White Sulphur Springs NFH in 1976.	PTS,PTL	
ASSINCIA Quinebaug SFH		7	N	Single introduction from New York in 1978.	PTL	Stocked fish are long lived, give good returns and large size.
ROME STRAIN 69-78 Burlington, SFH		100	D	Single introduction of domestic fish from Rome, New York in 1977.	PTS,PTL	Resistant to furunculosis.

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State[b/] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Iowa						
NO NAME Manchester Trout Hatchery	Nov	100	D	Single introduction of domestic fish from St. Croix Falls (Wisconsin) SFH in 1977.	FS	Growth .025 inches per day at 50 F, highly susceptible to *Aeromonas*, seem to adapt readily to wild.
Maine						
MAINE HATCHERY STRAIN Phillips SFH	Oct-Nov	3000+	D	Single introduction of domestic fish from Basin Pond, Maine in 1964. Pond was stocked with domestic fish from the Gilbert Strain (Plymouth, Maine) and Paradise Strain (Pennsylvania) between 1955 and 1964.		When the brood fish were trapped in 1964, older fish were selected in an effort to improve longevity of the brood stock. Brood stock was developed from 1 male and 5 females.
ASSINICA STRAIN Phillips SFH	Oct 25-Nov 10	250	N	Single introduction of wild fish from Brandon Park, New York.	FL,OS	Maintained in a natural refuge pond. Used to produce F_1 hybrids with the maine Hatchery strain for stocking as fall fingerlings. Disease classification, A-2.

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State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Maine Continued						
TOMAH STRAIN Monah Lake	Oct 20- Nov 15	100	N	Multiple introductions from Maine Hatchery Strain (1966) and Basin Pond (1967 and 1968).	FL,OS	Selected for longevity since 1968.
Michigan						
NEW YORK (ROME) Oden SFH		1000	D	Origin unknown	FS,FL	Furunculosis resistant and grows well in hatchery.
ASSINICA Oden SFH		3000	N	Multiple introductions from the same source.	FS,FL	Grow very rapidly after stocking.

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State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Minnesota						
KEARNEYSVILLE Lanesboro SFH		250	D	Single introduction of domestic fish from Leetown NFH, (West Virginia) in 1964.	PTS,PTL, FS,FL, OS	
ROME LAB Lanesboro SFH		3000+	D	Single introduction of domestic fish from Rome, New York in 1980.	PTS,PTL, FS,FL, OS	
CRAWFORD Lanesboro SFH		3000+	D	Single introduction of domestic fish from Crawford NFH (Nebraska) in 1979.	PTL,PTS, FS,FL, OS	
New Hampshire						
ASSINCIA Star Lake, Springfield		100	N	Multiple introductions of wild fish from Black Pond, New York.	FL	Compared with domestic brood stock, assinica are longer living, attain greater size, fight harder when hooked, and are more colorful.

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State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
New York						
TEMISCAMIE Mountain Pond and Cat Pond	Oct 15-Dec 1	3000	N	Multiple introductions from Temiscamie Lake, Quebec.	FL,OS	Tolerant to acid waters, longevity 8+ years, reproduces well in ponds.
ROME LAB Fish Disease Control Unit, Rome		1000	D	Multiple introductions from different sources.	PTS,PTL, FS,FL	Bred for resistance to furunculosis.
North Carolina						
2SA8 Armstrong SFH, Marion	Oct 15-Nov 15	1000	D	Single introduction of domestic fish from Production Lot 2SA6 in 1979.	PTS,PTL, FS,FL	
4SA7 Armstrong SFH, Marion	Oct 15-Nov 15	250	D	Single introduction of domestic fish from production lot 4SA7 in 1978.	PTS,PTL, FS,FL	

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State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Oregon						
EAST LAKE Wizard Fall Hatchery		Number that can be trapped	D	Multiple introductions of wild fish from Little Cultus Lake, Oregon, starting in 1974.	FL	
Pennsylvania						
REYNOLDSDALE Reynoldsdale and Big Spring SFH	Sep 4-Oct 9	3000	D	Single introduction of domestic fish from Trexler Hatchery, Allentown, Pennsylvania in 1930.	PTS,PTL	Isolated from parent strain in 1930's, is free from bacterial kidney disease but is not as resistant to infectious pancreatic necrosis as Bellefonte Open Strain.
BELLEFONTE OPEN Spring Creek and Oswayo SFH	Sep 4-Oct 9	3000	D	Single introduction of domestic fish from Trexler's Hatchery, Allentown, Pennsylvania before 1940.	PTS,PTL	Good performance in hatchery and high resistance to infectious pancreatic necrosis.
HUNTSDALE Huntsdale and Big Spring SFH	SEP 4-Oct 9	3000+	D	Single introduction of domestic fish from Reynoldsdale Hatchery with some mixing from introduced fish in 1946.	PTS,PTL	Poor hatchability.

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State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Rhode Island						
(NO NAME) Lafayette SFH		500	D	Multiple introductions from different sources (composition too mixed to be reliable).	PTS,PTL	
CRAWFORD Lafayette SFH	Oct-Nov	3000	D	Single introduction of domestic fish from Crawford (Nebraska) NFH in December 1979.	PTS,PTL	
Vermont						
BENNINGTON Vermont State Fish Hatchery, Bennington	mid Oct	500	D	Single introduction of domestic fish from Rome Fisheries Laboratory (New York) in 1965.	PTS,PTL, FS,FL	Furunculosis resistant.

Table 13 Brook trout brood stock maintained by State Fish and Game Departments in 1980[a]. (Abbreviations: brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Virginia						
NO NAME Marion SFH	Oct	1200	D	Obtained as egg shipment from Paradise Brook Trout Company (Pennsylvania) in early 1960's.	FS,FL	About 582,000 eggs produced during 1979-1980 season.
Washington						
OWHI LAKE Ford SFH		3000+	D	Single introduction of domestic fish from U.S. Bureau of Fisheries in early 1900's (exact source unknown).	PTL,FL	
West Virginia						
EDRAY BROOK TROUT Edray Trout Hatchery Marlington		3000	D	Single introduction of domestic fish from Paradise Ranch, Pennsylvania and Hackettstown, New Jersey in 1950.	FL	

Table 13 Brook trout brood stock maintained by State Fish and Game Departments in 1980[a]. (Abbreviations: brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Wisconsin						
NO NAME St. Croix Falls, SFH	Oct	600	D	Single introduction of domestic fish as eyed eggs from Nashua NFH in 1974.	PTS,PTL, FS,FL	
Wyoming						
TEMISCAMIE Daniel Hatchery		500	D	Single introduction of domestic fish from New York State.	FS	
NO NAME Soda Lake, Pinedale		3000+	N	Multiple introductions from Shoshone Lake, Fremont County (original source unknown).	FS,FL	

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[a] Brood stock information taken from questionaires completed by State Fish and Game Departments during 1980. States reporting brook trout brood stocks are listed in the body of this table.

[b] Locality (city) shown separately when it is not included in the name of the hatchery.

Table 14 Lake trout strains being maintained in U.S. Fish and Wildlife Service National Hatchery System August 1981.

Strain	Hatchery	Disease Classification[a]	Spawning Period
Green Lake	Genoa, WI	B-BF-(BK)	
Jenny Lake	Jackson, WY	A-1	November
Jenny Lake	Lake Mills, WI	B-(BF)	November
Marquette	Tunison NFRL, NY[b]	A-2	November
Seneca	Allegheny, PA	A-1	October
Superior	Jordan River, MI	A-2	October-November

[a] Disease Classification: A-1=hatchery has a closed water supply that is free of fish and has been free of certifiable disease for a period of two years; A-2=hatchery has an open water supply or a closed water supply harboring fish and a two year history of being free of certifiable diseases; B=hatchery that has had one or more of the certifiable diseases within the past two years; BF=furunculosis; BK=bacterial kidney disease; BR=enteric redmouth; SC=*Ceratomyxa shasta*; VP=infectious pancreatic necrosis; VH=viral hemorrhagic septicemia; SBK=suspected bacterial kidney disease. Disease symbols include within a parenthetical are suspected of being diseased.

[b] NFRL=National Fishery Research Laboratory.

Table 15 Lake trout brood stock maintained by State Fish and Game Departments in 1980[a]. (Abbreviations: brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses).

State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Maine						
ALLAGASH STRAIN Allagash Lake	Oct 1-10	500	N	Wild fish with no known supplemented stocking.	FL	Wild lake trout population (unknown stocking of hatchery fish). Annual surveys for infectious pancreatic necrosis since 1970 and have shown the fish to be free of this virus.
FINGER LAKES STRAIN	Sep 20-Oct 5	Unknown	N	Wild fish with supplemented stocking.	FL	Spawns at great depths (over 30m) in the Finger Lakes; strains used in lakes with severe water level fluctation during egg incubation.
MANITOBA STRAIN Governor Hill SFH, Augusta	Sep 20-Oct 5	100	D	Single introduction of wild fish from Clearwater Lake, Province of Manitoba, in 1963.	FL	Fish have a tendency to migrate to inlet or outlet stream for spawning. Brood stock has been surveyed annually for infectious pancreatic necrosis since 1965 and is free of the virus.

Table 15 Lake trout brood stock maintained by State Fish and Game Departments in 1980[a]. (Abbreviations: brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Michigan						
LAKE SUPERIOR Marquette SFH		3000	D	Multiple introductions from the same source.	OS	Yearlings stocked in Great Lakes and selected inland lakes.
APOSTLE ISLANDS Marquette SFH		500	D	Single introduction of wild fish from Apostle Island, Lake Superior in 1959.	OS	Yearlings stocked in Great Lakes and selected inland lakes.
New York						
RAQUETTE LAKE		3000	N	Wild fish with supplemental stocking since 1933.	OS	Native to Adirondack waters. Survival in Adirondack waters was superior to that of other strains stocked there.
FINGER LAKES Seneca and Cayuga Lakes		3000+	N	Wild fish with supplemental stocking since 1917.	FL	Has good survival in ologotrophic waters.

Table 15 Lake trout brood stock maintained by State Fish and Game Departments in 1980[a]. (Abbreviations: brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Wyoming						
STORY MACHINAW BROOD STOCK Story SFH		1000	D	Single introduction of wild fish from Jenny Lake near Moran, Wyoming, in 1964.	FL	

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[a] Brood stock information taken from questionaires completed by State Fish and Game Departments during 1980. States reporting lake trout brood stocks are listed in the body of this table.

[b] Locality (city) shown separately when it is not included in the name of the hatchery.

Table 16 Cutthroat trout strains being maintained in U.S. Fish and Wildlife Service National Hatchery System August 1981.

Strain	Hatchery	Disease Classification[a]	Spawning Period
Colorado River	Saratoga, WY	B-(BR)	April
Lahontan (Summit Lake)	Lahontan, NV	B-BK	January-March
Lahontan (Omak Lake)	Winthrop, WA	B-BK(BF-SC-BK)	June
Paint Rock (Yellowstone)	Saratoga, WY	B-(BR)	April
Snake River	Jackson, WY	A-1	June-July
Westslope	Creston, MT	A-2	May

[a] Disease Classification: A-1=hatchery has a closed water supply that is free of fish and has been free of certifiable disease for a period of two years; A-2=hatchery has an open water supply or a closed water supply harboring fish and a two year history of being free of certifiable diseases; B=hatchery that has had one or more of the certifiable diseases within the past two years; BF=furunculosis; BK=bacterial kidney disease; BR=enteric redmouth; SC=*Ceratomyxa shasta*; VP=infectious pancreatic necrosis; VH=viral hemorrhagic septicemia; SBK=suspected bacterial kidney disease. Disease symbols include within a parenthetical are suspected of being diseased.

Table 17 Cutthroat trout brood stock maintained by State Fish and Game Departments in 1980[a/]. (Abbreviations: brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses).

State[b/] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Colorado						
SNAKE RIVER Roaring Judy Hatchery	Nov	3000	D	Multiple introductions from the same source.	FS,FL	Also found in Haypress Lake where the spawning season is May-June.
COLORADO RIVER Crystal River Brood Unit	Apr-May	3000	D	Multiple introductions from the same source.	FS,FL	
COLORADO RIVER Trapper Lake	Jun	3000+	N	Wild population with no known supplemental stocking within the last 20 years.	FS,FL	
PIKES PEAK Colorado Springs Water Supply Reservoirs	Jun-Jul	3000+	N	Multiple introductions from different sources into the reservoirs.	FS,FL	
YELLOWSTONE Haypress Lake	May-Jun	3000	N	Multiple introductions from the same source. Fish stocked annually.	FS,FL	

Table 17 Cutthroat trout brood stock maintained by State Fish and Game Departments in 1980[a]. (Abbreviations: brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Idaho						
BEAR LAKE	May 1-Jun 15	3000+	N	Brood stock is native to Bear Lake.	OS	Progeny stocked back into Bear Lake.
KINGS LAKE (WESTSLOPE) Clarkfork SFH		3000+	D	Single introduction from Priest Lake, Idaho, in 1940.	PTS,PTL, FS,FL	
KINGS LAKE Hayden Lake		3000+	N	Single introduction from Priest Lake, Idaho, in 1940.	OS	Used for restocking of Hayden Lake. Other species have also been added to Hayden lake.
KINGS LAKE Fish Lake, McCall		1000	N	Single introduction from Priest Lake, Idaho, in 1940.	FL,OS	
NO NAME Henrys Lake		3000+	N	Multiple introductions from different sources including Henrys lake cutthroat, Yellowstone cutthroat, Rainbow X Cutthroat hybrid, and steelhead X cutthroat hybrids.	PTS,PTL, FS,FL	

Table 17 Cutthroat trout brood stock maintained by State Fish and Game Departments in 1980[a]. (Abbreviations: brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Montana						
McBRIDE LAKE Yellowstone River, Big Timber	Mar 25-May 15	1000	D	Single introduction of wild fish from McBride Lake in 1969.	FL,OS	The strain shows typical markings of cutthroat trout taken from Yellowstone Lake, but yields higher survival in high mountain lakes. Three-year-old fish average 4 pounds.
HUNGRY HORSE Murray Springs Hatchery, Eureka	May 1-Jun 15	1000	D	Single introduction of wild fish from Hungry Horse Reservoir in 1965.	FL,OS	A westslope cutthroat brood stock showing good stream survival characteristics.
Nevada						
WALKER LAKE Marlette Lake	Jun 10-25	3000+	D	Single introduction of fish (domestic) from Walker Lake/ Verdi Hatchery in 1963.	PTS,PTL	Well adapted to highly alkaline waters of the state; good growth rate.
HEENAN LAKE A) Marlette Lake	Jun 10-25	3000+	D	Multiple introductions from the same source.	PTS,PTL	Well adapted to highly alkaline conditions; good growth rate.

Table 17 Cutthroat trout brood stock maintained by State Fish and Game Departments in 1980[a]. (Abbreviations: brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Nevada Continued						
B) Catnip Reservoir	May 1-25		D	Multiple introductions from same source	PTS,PTL	
New Mexico						
RIO GRANDE CUTTHROAT San Pedro Parks drainage, Santa Fe National Forest, New Mexico Drainage, Little Rio Grande drainage, and Carson National Forest.	Apr-Jun	3000+	N	Wild fish with supplemental stocking.	OS	Extremely wild.
Oregon						
LAHONTAN CUTTHROAT Mann Lake		500	D	Multiple introductions from the same source (Hot Creek Hatchery, California).	PTL	Well adapted to alkaline lake waters of central and eastern Oregon.
LONG TOM Leaburg SFH		500	D	Single introduction of wild fish from Long Tom River, tributary to Willamette River, in mid 1960's.	FL	Used for high lake plants of fingerlings.

Table 17 Cutthroat trout brood stock maintained by State Fish and Game Departments in 1980[a]. (Abbreviations: brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Oregon Continued						
NORTH NEHALEM Cedar Creek Hatchery		3400	N	Single introduction of wild fish from North Nehalem in 1979.	PTS	Used for cutthroat fishery.
ALSEA COASTAL Alsea SFH		3000	D	Wild fish with no known supplemental stocking. Wild fish were taken in mid 1930's.	PTS	Stocked to provide fishing for sea run cutthroat trout in fall.
BIG CREEK CUTTHROAT Big Creek SFH		Whatever can be trapped	N	Single introduction of wild fish from Big Creek in 1980.	PTS	First year of program.
Utah						
BEAR LAKE Egan Hatchery and Bear Lake	Feb-May	3000	N	Wild fish with supplemental stocking each summer with fingerlings reared in the hatchery.	FL	First mature as 4-year-olds. Grow well and seem to be hardy in the hatchery. Good looking trout. After 3rd year of spawning, mortality increases considerably.

Table 17 Cutthroat trout brood stock maintained by State Fish and Game Departments in 1980[a]. (Abbreviations: brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Utah Continued						
STRAWBERRY CUTTHROAT Strawberry Reservoir, Wasatch County	Jun	2000	N	Wild fish with supplemental stocking of fingerlings each summer from fish reared in the hatchery. Spawn taken only from wild fish in Strawberry Reservoir.	FL	Good appearance. Produce large eggs; percentage eyed-eyes good. Exhibit "wild behavior" in hatchery.
Washington						
COWLITZ RIVER (ANADROMOUS) Cowlitz SFH		3000+	N	Multiple introductions from wild Cowlitz River population.	OS	
BEAVER CREEK Beaver Creek Hatchery		3000+	M	Multiple introductions from different sources.	PTS, PTL, OS	Mixture of several coastal strains. Originally anadromous now used for stocking as both anadromous and resident fish. Successfully used in Beaver Ponds.

Table 17 Cutthroat trout brood stock maintained by State Fish and Game Departments in 1980[a/]. (Abbreviations: brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b/] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Washington Continued						
KINGS LAKE Ford Hatchery and Kings Lake		3000+	N	Single introduction of wild fish from Priest Lake, Idaho, in 1940.	FL	Primary egg source is Kings Lake. Attempts to hold brood stock at Ford Hatchery were relatively unsuccessful.
TWIN LAKES (RESIDENT) Twin Lakes		3000	N	Multiple introductions from different sources.	OS	Adults trapped on spawning runs into tributary streams. Classified as intermontane cutthroat trout.
TOKUL CREEK (RESIDENT) Tokul Creek Hatchery		1000	N	Single introduction of wild fish from Lake Whatcom tributaries in 1978.	FS,FL OS	Restart of brood stock in use since 1948.
HOOD CANAL Manchester Net Pens		1000	N	Multiple introductions from the same source.	OS	Held in net pens in Puget Sound until mature when they are spawned directly out of salt water pens. Reared to smolt size in fresh water, then transferred to pens. Used primarily for stocking in Hood canal.

Table 17 Cutthroat trout brood stock maintained by State Fish and Game Departments in 1980[a]. (Abbreviations: brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Wyoming						
UTAH CUTTHROAT Daniel SFH		100	N	Single introduction of wild fish from Raymouth Creek (Lincoln County).		Was started to help re-establish Utah cutthroat trout in southwestern Wyoming after this fish was considered for endangered species list. No eggs taken prior to 1980. Only known Utah Cutthroat brood stock.
YELLOWSTONE CUTTHROAT Clark's Fork Hatchery, Park County		1000	N	Multiple introductions of wild fish from South Paint Rock Creek, Big Horn River Drainage.	FS,FL	Pure strain of the stream variety of Yellowstone cutthroat trout.

Table 17 Cutthroat trout brood stock maintained by State Fish and Game Departments in 1980[a]. (Abbreviations: brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery SFH=State Fish Hatchery)	Use	Other information
Wyoming Continued						
SNAKE RIVER Lake of the Woods Fremont County Debois		3000+	N	Multiple introduction of wild fish. First introduction from Blue Crane Creek Teton County, Snake River Drainage in 1958 with periodic introduction thereafter from BAR BC Spring Creek, Teton County, Wyoming.	PTS, FS, FL	
COLORADO CUTTHROAT Sheep Mountain Lake, Pinedale		100	N	Multiple introductions of wild fish from North Beaver, tributary to South Piney Creek, Green River Drainage.	FS, FL	One of the few pure strains of Colorado River cutthroat trout.

Table 17 Cutthroat trout brood stock maintained by State Fish and Game Departments in 1980[a]. (Abbreviations: brood stock type — D=domestic; M=mixed domestic and natural brood stocks; N=natural reproducing "wild" brood stock. Use — FL=fingerling stocking in lakes; FS=fingerling stocking in streams; PTL=put-and-take stocking in lakes; PTS=put-and-take stocking in streams; OS=other special uses). (Continued)

State[b] and brood stock (SFH=State Fish Hatchery)	Spawning season	Breeding adults	Brood stock type	Origin (NFH=National Fish Hatchery, SFH=State Fish Hatchery)	Use	Other information
Wyoming Continued						
SNAKE RIVER Auburn Hatchery	Winter	3000+	D	Single introduction of wild fish from Flat Creek (Jackson Hole) in 1953.	PTS,PTL, FS	Selectively bred for spawning time (winter), longevity, and number of eggs produced.

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[a] Brood stock information taken from questionaires completed by State Fish and Game Departments during 1980. States reporting cutthroat trout brood stocks are listed in the body of this table.

[b] Locality (city) shown separately when it is not included in the name of the hatchery.

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